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THE UNIVERSITY OF ALBERTA

ECONOMIC DEVELOPMENT AND NATIVE HEALTH IN THE NORTHWEST TERRITORIES

by

© MICHAEL BRIAN WAHN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled ....

Economic Development and Native Health in the

Northwest Territories

submitted by Michael Brian Wahn

in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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Abstract

This study examines the relationship between levels of economic development in the Northwest Territories of Canada and the health of the Inuit (Eskimos) and Dene (Indians) who live there.

Such problems as alcoholism, psychological disorders, physical illness and infant disease and death are extremely common among native people living in the region. Are they more serious in the larger and more highly developed communities, those with large white populations, varied job opportunities, educational and health care facilities (and liquor outlets), or are the problems more serious in the small native settlements which depend almost exclusively on hunting and trapping?

Data regarding the 55 N.W.T. communities are drawn from 1961 and 1971 census tapes and from the results of a large Manpower survey conducted between 1968 and 1970 by the Department of Indian Affairs and Northern Development. But most of the data comes from the N.W.T. Perinatal and Infant Morbidity and Mortality study carried out between 1972 and 1975 by the Department of National Health and Welfare. Complete health records for the first year of life were collected for each of the 452 Inuit infants and 261 Dene infants born in the N.W.T. between April 1, 1973 and March 31, 1974. In addition, the mothers of each child were interviewed to obtain information about the social and economic characteristics of their families.

Dene infants living in the more highly developed communities are the healthiest. Their parents' use of alcohol is lowest. In contrast, Inuit infant health shows no relationship with the level of community economic development. Parental alcohol use is greatest in the more highly developed communities.

Health problems and alcohol use are especially pronounced in Dene families which occupy positions of relative deprivation: those without wage employment but a high level of education, those without jobs in highly developed communities, and so on. Relative deprivation does not seem to affect Inuit infant health or alcohol use adversely.

Several explanations for the differences between the two groups are advanced. Most weight is placed on the historical differences in the timing and nature of contacts with whites. Dene have had a half-century or more of contact with white society through intermarriage, education, wage employment and the fir trade. Nearly all speak English. The Inuit came into contact with whites much more recently, in the 1950's and 1960's. Most do not speak English. As a result the Inuit are not acculturated enough to feel deprived, even when living at a subsistence level.

The Inuit are changing, however, and soon they too will require higher levels of economic development (of types which do not create more relative deprivation than they eliminate) to combat their health problems.

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TABLE OF CONTENTS

CHAPTER PAGE

I. INTRODUCTION 1

II. ECONOMIC DEVELOPMENT AND NATIVE HEALTH: CONFLICTING HYPOTHESES 9

Economic Development and Health 9

The Benefits of Development 22

The Costs of Development 28

Summary 45

III. MEASURING NATIVE HEALTH 47

Selection of The Dependent Variables 47

The Perinatal and Infant Morbidity and Mortality Study 53

Operationalization of The Dependent Variables 57

Intercorrelations among The Dependent Variables 85

Summary 89

IV. THE BENEFITS OF DEVELOPMENT 92

Hypothesis I. Economic Development and Health 92

Hypothesis II. Community Health Services and Health. 107

Hypothesis III. Education and Health 112

Hypothesis IV. Wage Employment and Health. . 117

A Path Model. 123

Summary 132

V. THE COSTS OF DEVELOPMENT 134

Hypothesis V. Rapid Change and Health . . . 134

CHAPTER PAGE

Hypothesis VI. Acculturation and Health. . . 145

Hypothesis VII. Relative Deprivation and Health 171

Summary 178

VI. CONCLUSIONS 180

Summary of the Results 180

Limitations of the Data 185

Discussion of the Results 187

NOTES 211

REFERENCES 226

LIST OF TABLES

Table	Description	Page
III-1	Mother's alcohol use by father's alcohol use	60
III-2	Severity scores for infant diseases and health conditions, by age groups	72
III-3	Infants' scores on the composite index of infant health	80
III-4	Correlations among measures of infant health (excluding infants who died during the year)	83
III-5	Correlations among measures of infant health (including infants who died during the year)	84
III-6	Intercorrelations among measures of the dependent variables, Dene	86
III-7	Intercorrelations among measures of the dependent variables, Inuit	87
IV-1	Settlements of the Northwest Territories, economic growth, 1960 to 1970	96
IV-2	Settlements of the Northwest Territories, population growth, 1960 to 1970	98
IV-3	Correlation coefficients, measures of community economic development, settlements of the Northwest Territories, 1971	100
IV-4	Correlation coefficients, measures of community economic development, settlements of the Northwest Territories, 1961	101
IV-5	Correlation coefficients, measures of community economic development and measures of native health, Dene	103
IV-6	Correlation coefficients, measures of community economic development and measures of native health, Inuit	104
IV-7	Curvilinearity, Dene and Inuit health with community economic development	106
IV-8	Dene health by the type of medical facilities available in the settlement	109

Table	Description	Page
IV-9	Inuit health by the tupe of medical facilities available in the settlement	110
IV-10	Unstandardized and standardized regression coefficients, Dene health regressed on education and community economic development	115
IV-11	Unstandardized and standardized regression coefficients, Inuit health regressed on education and community economic development	116
IV-12	Dene health by occupation	119
IV-13	Inuit health by occupation	120
IV-14	Unstandardized and standardized regression coefficients, Dene health regressed on father's months of wage employment and on community economic development	121
IV-15	Unstandardized and standardized regression coefficients, Inuit health regressed on father's months of wage employment and on community economic development	122
IV-16	Path analysis, Dene	126
IV-17	Path analysis, Inuit	127
IV-18	Correlation matrix, Dene	130
IV-19	Correlation matrix, Inuit	131
V-1	Dene health and the rate of community economic growth, 1960 to 1970	139
V-2	Dene health and the rate of population growth, 1961 to 1971	140
V-3	Inuit health and the rate of community economic growth, 1960 to 1970	143
V-4	Inuit health and the rate of population growth, 1961 to 1971	144
V-5	Frequency distributions for items of acculturation scale	148
V-6	Unstandardized and standardized regression coefficients, Dene health regressed on	

Table	Description	Page
	acculturation, breast-feeding practices and community economic development	150
V-7	Unstandardized and standardized regression coefficients, Inuit health regressed on acculturation, breast-feeding practices and community economic development	152
V-8	Regression equations, Dene	155
V-9	Regression equations, Inuit	157
V-10	Correlation matrix, Dene	158
V-11	Correlation matrix, Inuit	159
V-12	Curvilinearity, Dene and Inuit health with acculturation	162
V-13	Interaction effects: acculturation, community economic development, community languages and Dene health	166
V-14	Interaction effects: acculturation, community economic development, community languages and Inuit health	167
V-15	Interaction effects: acculturation, education, wage employment and Dene health	169
V-16	Interaction effects: acculturation, education, wage employment and Inuit health	170
V-17	Relative deprivation and Dene health	174
V-18	Relative deprivation and Inuit health	176
V-19	Relative deprivation and Dene health: the interaction effect of wage employment and education (dichotomized) on Dene health	177

LIST OF FIGURES

Figure		Page
III-1	Determinants of the number of inpatient days	65
IV-1	Revised path model	124
V-1	Insertion of acculturation and breast-feeding into the path model	154

Chapter I

INTRODUCTION

The Northwest Territories, a vast expanse of land, water and ice comprising more than one-third of Canada's land mass, has recently begun to capture the attention of Canadians. Its energy and mineral resources are becoming valuable, due to growing shortages throughout the world and to improved methods of extraction and delivery. Government departments and business enterprises which previously ignored the North have now turned their attention to the possibility of exploiting these resources.

With a few exceptions--the fur trade, the whaling industry, the Norman Wells oil field, the uranium and gold mines at Great Bear and Great Slave Lakes--efforts to develop northern natural resources have occurred only since the Second World War, with by far the greatest escalation in economic activity taking place within the past fifteen years. During the same period a rapid expansion of government services, health, welfare, education, communications and so on, has also taken place. The future appears to promise an even greater acceleration of economic development in the region.

Many of the Inuit, Dene and Metis of the N.W.T. have therefore seen the economy of their homeland transformed, before their eyes, from subsistence-level harvesting of animals for food and fur to large-scale industrial projects which use heavy machinery and sophisticated engineering and construction methods. In less than a generation, in some parts of the N.W.T., native people have moved from a traditional bush existence, a semi-

nomadic life of fishing, hunting and trapping, to a modern urban way of life with permanent housing in large settlements, formal education, wage employment, health and welfare programs, supermarkets, television and increasingly closer contact with white Canadians born and raised in the South.

At the same time as Canadians are beginning to recognize the N.W.T.'s resource potential, they are also becoming aware of the possible negative consequences of large scale development projects, both for the fragile northern environment and for the health and well-being of the northern native peoples. A series of strenuous debates have arisen concerning the relative benefits and costs, the positive and negative "impacts", of various resource development proposals. Will the costs to the environment of off-shore natural gas drilling outweigh the economic benefits? Will the economic and social benefits of a new mine more than compensate for the social disruption it will cause? There appears to be agreement that every development project entails social costs as well as economic benefits; the debate occurs when different interested parties attempt to estimate the magnitudes of each.

A recent example of this kind of debate occurred during the MacKenzie Valley Pipeline Inquiry, 1976-77, headed by Mr. Justice Thomas Berger. In addition to environmental questions, the Berger Inquiry examined the potential cultural, economic and social impacts of the construction of a MacKenzie Valley natural gas pipeline, the largest development project ever proposed for the N.W.T. Berger's recommendation was that no such project be undertaken for at least ten years because the social costs to the native people in the region would be too great.[1]

The body of evidence collected by the Inquiry was immense and filled with contradictions. Some witnesses testified that the pipeline would bring important social benefits, in the form of greater employment opportunities and higher incomes for native people, and that with proper precautions the social costs could be minimized. Others testified that the costs, in terms of human misery, would outweigh the economic benefits native people would receive. In general the native people who testified did not want the pipeline; they were afraid of it and thought they would suffer from it.

The MacKenzie Valley pipeline, as of this writing, appears to have been shelved in favour of a pipeline along the Alaska Highway. The Berger recommendations may have influenced this decision. But the question the Berger Inquiry addressed, whether northern natives gain or lose by large industrial projects, still remains. With more large-scale projects likely to come forward as energy and mineral resources grow scarce, this question is destined to resurface again and again. Northerners and government policy-makers will be forced repeatedly to assess and debate the relative benefits and costs of economic development for the native people of the North.

The research reported here was an attempt to explore one aspect of this question: what are the effects of economic development on the health of the native people of the Northwest Territories? It was an attempt to find out if, as some suggest, rapid development is essential to raise levels of health, very poor among northern natives in comparison with other Canadians, or if, as Berger concluded, large-scale industrial projects like the pipeline will lead to even further deterioration in the health of native people.[2]

The research strategy employed in this study was to match patterns of economic development in the N.W.T. with patterns of health and illness, at a single point in time, the early 1970's. Some regions and communities are relatively highly developed; others remained quite undeveloped, except for hunting and trapping. If native health is better in the highly developed regions, then it can be concluded (tentatively at least) that development brings more benefits than costs in terms of health. If native health is worst in communities with a high level of development and best in the traditional bush settlements, then it can be concluded that the costs of development outweigh the benefits, at least where health is concerned.

This was the major hypothesis tested in this study, that economic development is (positively or negatively) associated with native health. The arguments supporting both sides of the debate as well as the sociological theories from which they are drawn, are presented in Chapter II below. Writers who argue that development is beneficial in its net effects point to improvements in medical facilities, to higher levels of education, to increased opportunities for wage employment and to higher standards of living as factors promoting improved health. Hypothesis II, that health is positively associated with the range of health services available in the community, Hypothesis III, that health is positively associated with levels of formal education and Hypothesis IV, that health is positively associated with participation in wage employment, are discussed in this chapter.

Later in the chapter the arguments regarding the possible adverse consequences of economic development are presented: the disintegrative and therefore harmful effects of rapid economic and demographic change; the

confusions of acculturation when one is exposed and forced to adapt to a foreign culture vastly different from the culture learned as a child; the frustrations of feeling relatively deprived economically, in comparison with whites for example; the demoralizing effects of suddenly becoming a powerless minority in a land once occupied solely by native people. These are the factors Berger and other writers believe underly a negative association between economic development and native health. Hypotheses V to VIII deal with some of these variables.

In this study then, an attempt has been made to isolate and measure the effects on native health of each of the aspects of development thought to be beneficial and each of the aspects thought to be detrimental to health. The net or total effect of economic development on native health is thus broken down into a number of indirect effects and the magnitude of each indirect effect estimated.

Most of the data for this study were drawn from records collected for the recent Northwest Territories Perinatal and Infant Morbidity and Mortality study (hereafter abbreviated P.I.M.M.) conducted from 1972 to 1975 by the Department of National Health and Welfare, Northern Medical Services Branch. The P.I.M.M. study was undertaken to find out the reasons for poor infant health in the N.W.T. The researchers gathered together health records for each child born in the N.W.T. between April 1, 1973 and March 31, 1974. All illness experiences during the child's first year of life were recorded and interviews with the child's mother were undertaken to obtain information on family nutrition and on other social and economic aspects of family life.

Additional data for this study were obtained from 1961 and 1971

Census tapes. Census data were used to measure the degree of economic development in each time period for each of the approximately fifty N.W.T. communities, as well as to measure the rate of economic and demographic change each community experienced between 1961 and 1971. In addition, a large manpower survey conducted by the Department of Indian Affairs and Northern Development from 1968 to 1970 provided two variables describing the N.W.T. communities.

The analysis of these data was performed separately for each of the two major native ethnic groups, the Dene and the Inuit. There are several reasons for this: there are substantial cultural differences between the two groups; they have had different histories regarding the kinds and amount of contact with white Canadians; and members of each group clearly regard the groups as separate and distinct. Thus the two groups may be expected to differ in their response to economic development. However, there is insufficient discussion in the literature to allow different sets of hypotheses to be formulated for each group. Writers tend to comment solely upon one group, to the exclusion of the other, or else to discuss both groups together without recognizing their social and cultural distinctiveness; few writers systematically compare and contrast in such a way as to suggest different hypotheses for each group. Thus the hypotheses outlined in chapter II were tested for the Dene and for the Inuit in turn.

The dependent variable in this study was health, defined in the broadest sense to include emotional and psychological health as well as physical health. Six indicators of health were drawn from the P.I.M.M. study: four measures of infant health, a measure of parents' alcohol use

and a measure of the extent to which parents made use of the preventive health services, pre-natal and well-baby care, now available in most inhabited parts of the N.W.T. Chapter III presents the reasoning behind the choice of these six indicators to represent the broader spectrum of health conditions. Detailed discussion of the data collection methods used in the P.I.M.M. study as well as the procedures used to construct each measure are also presented in Chapter III.

The major independent variable was the level of economic development of the community in which the child and his family reside. Five measures of community economic development, derived from Census data, are described in Chapter IV, which is entitled "The Benefits of Economic Development." Correlations among measures of economic development and measures of native health are presented. Findings pertaining to the effects of the types of medical facilities available, the level of education, and the participation in wage employment on native health are also presented in this chapter. At the end of the chapter a path model is suggested and the parameters estimated.

Chapter V, entitled "The Costs of Economic Development", presents the findings pertaining to the effects of rapid economic and demographic change, acculturation and relative deprivation on native health. For each of these, the procedures used to operationalize the variables and test the hypotheses are described. A modified path model and estimates of its parameters are presented. Tests of curvilinearity and interaction, suggested in some of the hypotheses, are reported.

The final chapter summarizes the findings of the study and, with consideration of its methodological shortcomings, assesses the amount of

support they provide for the contradictory hypotheses about the effects of economic development on native health. It is hoped that this study will in small measure help to clarify if not resolve the debate about the relative benefits and costs of economic development for native people and thus will be useful for helping the various interested parties and the policy-makers choose the best pace and kind of economic development to take place in the Northwest Territories.

Chapter II

ECONOMIC DEVELOPMENT AND NATIVE HEALTH: CONFLICTING HYPOTHESES

The source of the hypotheses of this study is the current debate over the consequences of economic development projects for the health and well-being of northern native people. Advocates of increased development argue that its benefits, including improved health services, improved opportunities for education and wage employment, and higher standards of living for native people, serve to improve their health. Thus a direct association between native health and the level of economic development in the community is hypothesized in this study. But opponents of development disagree. They assert that economic development entails social costs which outweigh its benefits. They point to the social and individual breakdown which occurs when economic and social change takes place too rapidly. They state that traditional peoples find it difficult to adapt to an industrial system and its foreign culture. They suggest that the development process increases frustration for native people by producing expectations which cannot be met. They describe a social structure, resulting from development, in which native people comprise a powerless underclass dominated by the whites who are in control of the development process. For these reasons the second hypothesis is exactly the reverse of the first: that an inverse association between native health and economic development exists. The remaining hypotheses of the study are drawn from both sides in the debate. Some concern the presumed benefits, others the presumed costs of development. They are outlined in

this chapter below.

Economic Development and Health

The federal government is presently very much in favour of economic development in the N.W.T. In a policy paper entitled Canada's North, 1970-1980 presented to Parliament in 1972, the government outlined its objectives in the North. Most important were to provide a higher standard of living for northerners, to protect the environment ("with due consideration to economic and social development") and to encourage resource development that would contribute to the national economy and to the material well-being of the Canadian population as a whole.[1]

The government made the admission, in the prologue to its policy paper, that these goals might conflict in some instances and that "an appropriate degree of balance" among them must be maintained:

> People, resources and environment are the main elements in any strategy for northern development. In the course of its policy review during the past year, the Government affirmed that the needs of the people of the North are more important than resource development and that the maintenance of ecological balance is essential. In the setting of objectives and priorities in the North, in line with national policy goals, the essence of choice for the Government is to maintain an appropriate degree of balance among those three elements.[2]

But despite acknowledging that "the needs of northerners" were to be more important than resource development, nowhere later in the document was it suggested that the two might even be incompatible, even for the native population. On the contrary, the paper identified poverty "with all its psychological, as well as physical characteristics" as northern natives' most pressing problem and hence an improved standard of living as their greatest need.[3] Economic development, it implied, is desirable not

only for its contribution to the Canadian economy but also as the solution to the problem of native poverty.

The policy paper painted several "alternative futures" for the N.W.T., each of which it declared unacceptable to the Government. One of these scenarios was characterized by the absence of industrial or resource development: natives would be in the majority because few whites would live in the North; natives thus would have a strong influence on events there, including substantial control over "the nature and degree of social and economic development" (though by implication they would be unable to effect much economic development). Natives' education and training would be "oriented to the northern environment", with an emphasis on hunting and trapping skills. In this scenario, according to the policy paper, native people would be dependent on welfare cheques and other social benefits from the South. Moreover, their high "natural rate of increase would aggravate already acute problems of localized over-population, social demoralization and discontent."[4]

It is simply the case, according to the policy paper, that the N.W.T. has too many native people and too little game to be self-sufficient with a traditional native economy. The territory's economic future "lies in the ground", with minerals, oil and natural gas.[5] These resources must be developed, by "Southern Canadians of high calibre and capability" including corporations[6], if it is to prosper. Native people can participate in the prosperity if they can acquire the education, the vocational training, the residential and job mobility necessary to take advantage of wage employment opportunities associated with resource development.

The government's priority for meeting the needs of northern natives therefore is to help them prepare for and find wage employment:

> No challenge in the North today is more pressing than the need to create employment opportunities for native northerners. The indigenous labour force is expanding quite rapidly but unless the native peoples are adequately trained and prepared for wage employment, they may not be able to take advantage of growing job opportunities. The problem is one of education and training, of influencing potential employers and prospective employees, and also of diversifying economic activities.[7]

> Perhaps the most important need . . . is to get rid of myths about the Eskimos ('Eskimos want to continue their traditional nomad life', 'they can be insulated from the new influences at work in the North', 'they are unable to adapt to life in the South', etc.). Some Eskimos have shown keen interest in the material aspects of modern society and an eagerness to adapt themselves to it. The real need is to concentrate on means of enhancing the Eskimos' self-respect and livelihood, especially through diversified education and vocational training and fundamentally to give them mobility and freedom of choice. It is results such as these that the policies proposed in this document are intended to promote for the native peoples.[8]

The government believes many of the health problems now prevalent among northern natives--infant mortality, tuberculosis, psychiatric disorders, alcoholism and so on--would improve if the standard of living in the N.W.T. were to rise. Such a belief appears reasonable in view of evidence showing a close association between poverty and ill-health around the world and in Canada.

Comparing nations, there are strong correlations between their degree of economic development as measured by per capita Gross National Product and the death rates and life expectancies of their populations. The industrialized countries have low death rates while the less economically developed nations have higher ones. Apparently the correlation is not due to differences in the adequacy of public health programs and

health care services between rich and poor nations, though such differences exist. Rapid declines in mortality occurred in Europe and North America before the important medical discoveries and advances in public health took place.[9] Similarly in Asia, recent declines in mortality rates are thought to have resulted from economic development rather than from public health programs, even such spectacular ones as the eradication of malaria in Ceylon.[10]

According to many writers who have studied underdeveloped countries, disease and underdevelopment combine into one of the many "vicious circles" which keep a nation poor.[11] If it is poor to begin with, then food shortages and dietary deficiencies, overcrowded housing, inadequate sanitation, illiteracy and lack of knowledge about personal hygiene, and perhaps feelings of demoralization and fatalism serve to keep disease and death rates high. And if the population is chronically ill, as is the case in many parts of the world,[12] it does not have the energy to contribute to economic growth. Health is both a consequence of economic development and a necessary condition for it.

If the poor are sicker and the sick are poorer, among nations of the world, the same appears to be true in Canada as well. For example, the poorest Canadians are the native people;[13] they are also the least healthy. The Inuit are estimated to have a life expectancy at birth of 45 to 47 years,[14] roughly the same as in Africa, compared to a life expectancy of 73 years for the Canadian population as a whole.[15] In the decade from 1963 to 1973, infant mortality rates for N.W.T. Dene have been at least double the Canadian rates while for Inuit infant mortality rates during this period have always been at least three times as great and in some years six times as great as the Canadian rates.[16] Preliminary

analysis of P.I.M.M. data shows that within the N.W.T. every infant disease is more common among Inuit and Dene babies than among white babies. For example, gastroenteritis was diagnosed during their first year of life for 50% of the 452 Inuit babies born in 1973-74, for 40% of the 261 Dene babies and for 22% of the 383 white babies. Pneumonia was diagnosed for 52% of the Inuit babies, 40% of the Dene babies and only 5% of the white babies. Otitis media, infection of the middle ear, is also common in the N.W.T. Nearly two-thirds of the Inuit babies received this diagnosis during the year, many several times. Among the Dene children 39% were diagnosed with otitis media while the figure was 16% among the white children.[17]

Adult morbidity patterns are probably similar though there is less information available. Tuberculosis has been defeated as a health problem for white Canadians but not for native people. The prevalence rate in 1971 was 17 cases per 100,000 population in Canada,[18] but in 1974 it was 258 per 100,000 for N.W.T. Inuit and 318 per 100,000 for Dene.[19]

The prevalence of psychiatric illness in the N.W.T. is believed to be extremely high, especially among native people.[20] Alcoholism is recognized as the most serious health problem for northern natives, because of its high prevalence and because it is a causal factor in most of the other illness conditions, from infant mortality to tuberculosis to natives' abnormally high rates of death due to accidents, violence and suicide.[21]

The government, according to its policy paper, believes that these health problems are rooted in native poverty and can be solved by economic development. This view is endorsed by some social scientists[22] as well as by the corporations hoping to participate in the development process. For

example, Canadian Arctic Gas Pipeline Limited, in support of its application to build a Mackenzie Valley Pipeline, asserted that the pipeline would have a positive impact on native health:

> Increased employment and income, resulting from the pipeline and associated developments, will foster a continuation of the existing trend toward improved health in the study region. This can be expected to result from improved housing, education, personal hygiene and urban services consequent upon the increased flow of cash in the region.
>
> An increase in income and the resulting improvement in housing, health care, recreational facilities and other services could tend to lessen underlying psychological pressures that contribute to excessive alcohol consumption. To the extent that this proves true, the impact of the construction of the pipeline on alcohol use patterns could be expected to be favourable.[23]

In summary, economic development and health are positively correlated around the world. In Canada the worst health is found among native people living in the least developed regions in the country. The government believes that economic development will improve native health and well-being and is actively encouraging northern development partly for that reason. Therefore it is hypothesized in this study:

Hypothesis Ia: That natives' health is positively associated with their community's level of economic development.

But the contrary hypothesis--that economic development has negative consequences for a population's health--has also been suggested, both for other underdeveloped parts of the world and for the N.W.T.

Hughes and Hunter, discussing disease and economic development in Africa, describe a number of instances in which development projects have unintentionally caused a deterioration in the health of the population.[24] Severe epidemics of malaria, sleeping sickness and schistosomiasis have

occurred because new roads were built through infected regions, because new dams and irrigation ditches provided breeding grounds for the mosquitos, tse-tse flies and snails which carry the diseases, and because migrant labourers attracted to development projects encountered new diseases to which they had built up no resistance or else brought with them into a region diseases previously unknown there. Agricultural development schemes to introduce high income cash crops (e.g. cocoa) have sometimes led African farmers to cease production of the high protein foods the population had been subsisting on. The resulting changes in diet to foods with less protein have produced malnutrition and, despite the improvement in income, a net deterioration in health. Economic development has induced migration into overcrowded cities where inadequate water and sewage systems allow infectious diseases to flourish and where nutritious "country food" is in short supply. In addition, suggest Hughes and Hunter, the urbanization, acculturation, social disintegration and relative deprivation that are part of the development process involve severe psychological stresses for Africans raised in traditional rural regions. The result is increased incidences, especially in the cities, of physical diseases (e.g. hypertension, tuberculosis), psychiatric disorders, alcoholism, violent behavior, witchcraft and sorcery, the tendency to retreat into fatalism and, in short, all "the pathologies of sustained despair."[25] Hughes and Hunter have coined a term, "developo-genic", to denote "those pathological conditions which can realistically be interpreted as consequences of the implementation of developmental schemes."[26]

Many of the same phenomena have been described in the N.W.T. On frequent occasions in the past, epidemics have decimated native communities

upon contact with whites and their new diseases.[27] Virtually the entire Inuit population of the Mackenzie Delta, once 2000 in number, died from diseases introduced by American whalers. (The present inhabitants of the Delta are mostly descendents of Alaskan Inuit who had through earlier contact achieved resistance to whites' diseases).[28] Epidemics are still a serious health problem in the North, now that nearly all the native people have moved off the land into the settlements, some of which are over-crowded and lacking in adequate water and sewage facilities. The Northern Health Service reported serious outbreaks of hepatitis in 1973 (Igloolik and Pond Inlet), 1974 (the Keewatin and Baffin regions) and 1975 (the Keewatin). In 1975, throughout the N.W.T., approximately 1100 persons were infected with bacillary dysentry and other gastroenteritis.[29]

Economic development has had negative consequences for native nutrition. Schaefer and other researchers have noted that northern natives have in recent times, begun to change from a diet of country food (caribou, seal, whale, fish) rich in protein and fat to a store-bought diet heavy in carbohydrates. The traditional diet provided more energy and protection against the cold; the new foods give empty calories and cause tooth decay.[30] The change has taken place for several reasons. Various aspects of development activity, including oil and gas exploration, road construction and pollution, have interfered with game cycles and migration routes. Hunters have (often reluctantly) abandoned their hunting camps in response to wage employment opportunities and government health, housing, education and social assistance programs in the settlements. Game stocks have declined in proportion to the population, especially near the settlements. Because of welfare and other benefits as well as income from

wage employment, natives now have the means, though often no alternative, to buy food at the store. Finally, contact with whites has altered the tastes and preferences of some native people in favour of imported "junk" food. According to Schaefer Inuit nutrition was, as recently as 1964, superior to that of a national sample of the U.S. population. He believes it has deteriorated markedly since then and is having serious consequences for Inuit health.[31]

One of the most detrimental dietary changes, in his opinion, has been the tendency for native women to give up breast-feeding their babies. This trend, most pronounced in the larger developed communities, is believed to be a cause of the near-epidemic incidence in the N.W.T. of infant diseases such as otitis media and respiratory infection.[32]

But nutritional deficiencies and epidemics of infectious diseases are not the most serious developo-genic health problems in the N.W.T., according to many observers. Instead they emphasize the various stress-related disorders and behaviors so prevalent in the North. These, they assert, are the consequences, not of poverty and insufficient economic development as the Canadian government believes, but of the development process itself. Hence they will be most prevalent in the regions and communities of the N.W.T. with the highest levels of economic development.

Much of the testimony before the Berger Inquiry was to this effect. Witness after witness--medical practitioners, academics, native people--described the adverse consequences of past development projects, from the Klondike gold rush to the Alaska oil pipeline and recent construction on the Mackenzie Valley highway. They documented increases in alcoholism, crime, violence, promiscuity and venereal disease. They discussed the exploitation of young native women by white transient workers and its

effects on native males and on family life. They spoke of intergenerational conflict and the breakdown of community cohesion and social control. They described the emergence of economic inequalities, between the white and native populations and within the native population. They spoke of the racism natives endured when whites moved into their communities. They testified to the loss of self-confidence and self-esteem native people suffered as a result. One northern psychologist went so far as to suggest that virtually the entire population of northern natives perhaps suffer from the psychiatric disorder known as reactive depression, as a consequence of the rapid changes which have been taking place:

> This disorder is recognized by a set of symptoms including passivity, lack of interest, decrease in energy, difficulty in concentration, lack of motivation and ambition, and a feeling of helplessness. These symptoms can vary in degree and from person to person and culture to culture. It has been suggested by many of my colleagues in psychology and psychiatry that this disorder is virtually endemic among the northern native people but at a sub-clinical level or perhaps simply unrecognizable as depression.[33]

Berger, summing up much of this testimony, attempted to explain why social assistance payments to natives have increased at the same time as wage employment has become more widely available:

> The recent increase in welfare payments and in related social problems that we have observed in the North has one basic cause: the force and suddenness with which industrial development has intruded into the region. During the past two centuries, the native people of the North have had to change a great deal and, by and large, they have shown a remarkable ability to adapt. But never before has there been such a sustained assault on their social institutions and relationships, on their language and culture, and on their attitudes and values. Never before have there been greater strains on the family. Should a husband or father

> stay in his community or work far away? Should the young people choose one way of life or another? Under the accumulated force of these pulls and pressures, communities are bound to disintegrate, families are bound to come apart, and individuals are bound to fail. The rising figures for welfare payments reflect to a considerable degree the impact of the industrial system on the native people of the North today.[34]

Many native witnesses agreed. They had observed these problems emerge, often within a span of just a few years, when development projects were introduced. Such was the experience, for example, of residents of Fort Simpson, a community which has undergone an economic transformation because of the construction of the Mackenzie highway. Fort Simpson experienced the fastest economic growth in the N.W.T. between 1960 and 1970, according to census figures. In 1960 it was a trapping community with a per capita annual employment income of $118 (per person fifteen years of age and older), one of the lowest in the N.W.T. In 1970, the year the highway was completed, its per capita annual employment income was $1,987, exceeded only by the six large towns in the Territory.[35] Fort Simpson natives testified before the Berger Inquiry about the consequences: alcoholism, crime and violence, family breakdown. Natives from nearby communities said, "We don't want to become another Fort Simpson." Both stated firmly that they did not want a pipeline because they believed it would have the same consequences, magnified many times, as the highway. Berger quotes Jim Antoine, Chief of the Fort Simpson band:

> I'm not worried about the money or the jobs this pipeline is going to give because, as Indian people, we don't think about the money. We think about the lives of the people here because, the way I see it, if this pipeline goes ahead, it's just going to destroy a lot of people. It's going to kill a lot of people indirectly. . . . I don't want the pipeline to come in here because, with the highway coming in in the last five to six years, it has changed Simpson altogether. A lot of problems arose out of this

> highway. If this pipeline comes through, it's going to cause problems to be a hundredfold more. We're the people who live here, and we're the people who are going to suffer.[36]

This point of view--that the pipeline would kill a lot of people--is in stark contrast with that of Canadian Arctic Gas who believed the social impact of the pipeline, including its impact on native health, would be beneficial. This disagreement is representative of the larger debate on the consequences of economic development for the lives and the health of native people.

It is a bit surprising then that little systematic research has been undertaken to find out how patterns of native health and well-being are related to patterns of economic development in the N.W.T. Where are physical health problems, including infant disease and death, most serious, in the larger developed towns or in the small hunting settlements? Where is alcoholism most prevalent? Where are psychiatric disturbances most common?

There has been only one study which has examined health conditions in a large number of N.W.T. communities. Hobart, studying Inuit infant mortality during the 1969-71 period, found the highest mortality rates in two large towns, Inuvik and Frobisher Bay, which by all indicators are the most highly developed of the Inuit communities. Several of the smaller settlements had infant mortality rates less than half as large.[37] Inuvik and Frobisher Bay have been the sites of a number of studies, all of which have documented the serious social and health problems there.[38]

On the basis of these studies and of Berger's conclusion that "there is every reason to believe that the construction of a pipeline and its aftermath would lead to further deterioration in the health of the native people,"[39] it is hypothesized in this study:

Hypothesis Ib: That natives' health is negatively associated with their community's level of economic development.

A third hypothesis can also be put forward--a "U-curve" hypothesis that economic development is harmful, because of its disruption of the traditional social system, until the point has been reached when the native population has begun to adjust successfully to a modern wage economy. From that point on, more development would bring better health by improving the standard of living. If this hypothesis is correct, then the highest levels of health would occur in very traditional communities where a significant amount of development has not yet taken place and in the modern communities where development is most advanced. The most troubled communities, in which levels of health would be low, would be those in between, communities in which the traditional social structure has been upset but in which a modern one has not yet been established. Therefore an alternative hypothesis in this study is:

Hypothesis Ic: That natives' health is associated with their community's level of economic development in a curvilinear relationship.

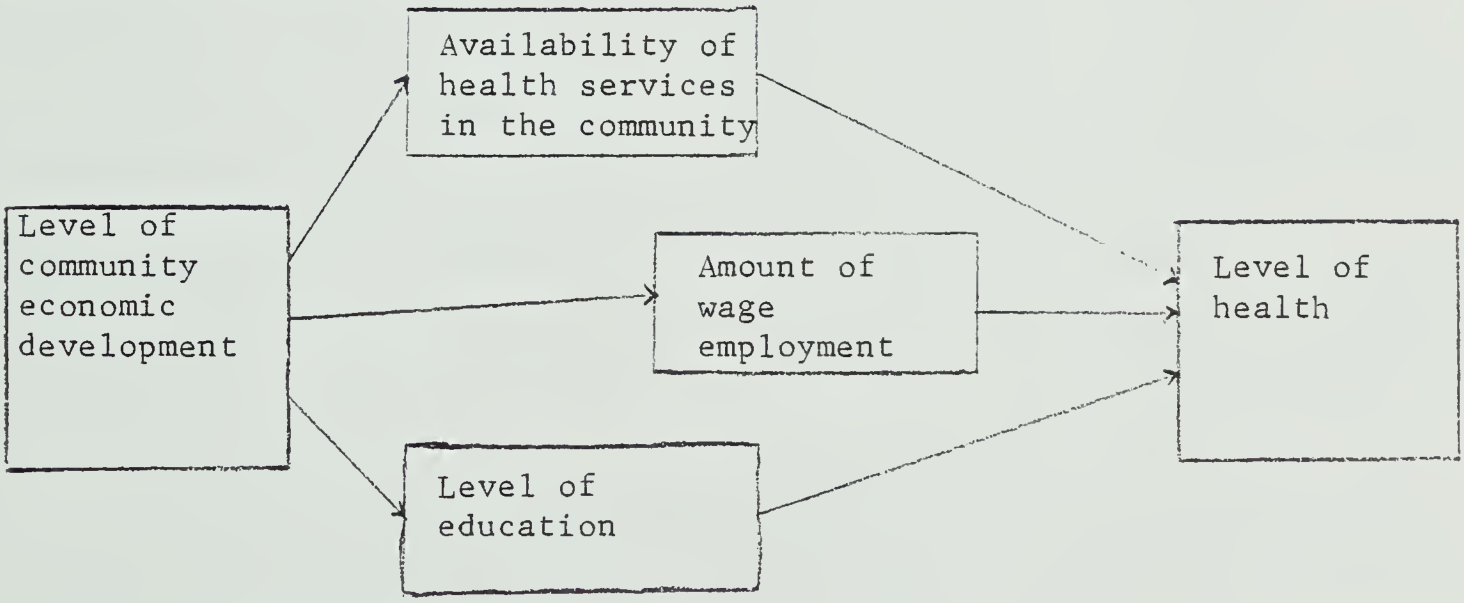
It is conceivable that all parties might agree that this hypothesis is, in the long run, correct. If so, there remains serious disagreement about the N.W.T. communities' present location on the U-curve. The federal government and Canadian Arctic Gas clearly feel the bottom has already been reached; their opponents, including Berger, feel that native health has further yet to fall, if development continues in the manner in which it has been taking place.

The Benefits of Development

Economic development brings with it many changes which are poten-

tially beneficial for health. These range from public health programs and well-staffed health facilities, feasible when a community's economic and population base becomes large, to the improvement in morale that accompanies economic security. In addition, a developed economy requires an educated labour force. Hence an improvement in the education level of the population usually takes place during the period of development. The education process has the effect of communicating knowledge regarding sanitation, nutrition and the nature of health and disease which members of a traditional population can then use to better their health. When economic development brings a higher standard of living, obtained by wage employment and entrepreneurial rewards in the new industries, then better housing, sanitation, nutrition and recreation can be purchased and health should improve.

It is for these reasons hypothesized that economic development and native health in the N.W.T. are positively correlated. The causal model is sketched below.


Availability of health services in the community
Level of community economic development
Amount of wage employment
Level of health
Level of education

Community health services

If for individuals, communities and nations poverty and ill-health form a vicious circle, then there are two points at which the circle can

be broken--reducing poverty and improving health. The government has been attempting both for N.W.T. natives, by encouraging economic development and by providing health services and programs in the native settlements.

The first health services in the N.W.T. were provided by the Roman Catholic and Anglican churches, which erected and staffed small hospitals in several communities from 1913 up to the 1930's. The federal government assisted with capital grants and per diem payments to the hospitals. Doctors were scarce and much of the treatment was provided by trained nursing sisters. From the 1920's until well into the 1950's the federal government sent doctors and nurses with the annual Eastern patrol, a voyage through the islands of the Eastern Arctic into Hudson's Bay. Inuit who resided in settlements or hunting camps along the route were given check-ups and treatment and were often evacuated on the ship if they had tuberculosis or another serious health problem.

By World War II there were small hospitals in twelve N.W.T. communities, though three were operated by mining and oil companies for their employees. Aklavik had two of the largest hospitals in the Territory since both the Roman Catholics and the Anglicans had established a presence (and some degree of competition) in the community. The smaller settlements and the native people living in the bush were without modern health services of any sort.

When the federal government expanded its activities in the N.W.T. in the 1950's and 1960's, health services were a top priority. Treatment of tuberculosis, including large-scale evacuations of infected persons to sanitoria in the South, was stepped up. Several of the mission hospitals were taken over and upgraded. Nursing stations, staffed by one, two or

more registered nurses, were built in most of the settlements. The nurses provided primary care, transferring the seriously ill by plane to communities with hospitals. They were responsible also for preventive care and health education to help reduce the incidence of disease.

By 1974, at the time of the P.I.M.M. study, there were modern hospitals staffed with doctors and nurses in the seven largest N.W.T. communities and a hospital operated by Imperial Oil at Norman Wells. Nursing stations were in operation in thirty-eight communities while a dozen or two of the hunting settlements were without health personnel of any kind.[40]

Health care facilities are most complete in the large developed communities where there are substantial white populations. They are least complete in the small settlements where few whites live and the natives support themselves by hunting and trapping. If the process of development is beneficial for native people, one of the reasons might be the improved health facilities that become available with development. Therefore it is hypothesized:

Hypothesis II: That there is a positive association between the quantity of health services available in the community and health.

Education

As with health facilities the Roman Catholic and Anglican churches built and operated the first schools in the N.W.T. The earliest mission schools opened in the 1920's and several were built during the next fifteen years. By 1938 there were a total of eighteen schools in the communities. Of these five were residential schools for children living outside the community. Four of the schools, including two residential schools, were located in Aklavik where both churches were active. Nearly one-half of

the 300 to 350 students enrolled in school throughout the N.W.T. went to Aklavik schools.[41] Despite the churches' efforts, only a very small minority of native children in the N.W.T. received any formal schooling.

In the post-war period the federal government greatly expanded education programs in the N.W.T. In the 1950's it built several larger residential schools with the intention of transporting children from small settlements and hunting camps into the major communities to attend school for ten months of the year. By 1961 government boarding schools had space for 1236 out-of-town students. A total of 3000 native children were enrolled in the N.W.T. in 1961, 80% of the treaty Indian children of school age and 59% of the Inuit children. A decade earlier the corresponding figures had been 36% of the Indian children and 8% of the Inuit children.[42]

Recently there has been a shift in government education policy away from large boarding schools. In their place small schools, some consisting of a single classroom, have been established in nearly all the N.W.T. settlements. In 1974 fifty-five communities had schools, all but a few of the smallest hunting settlements.[43] The five largest towns in the Territory had high schools. Now that virtually all parents live in the settlements, school hostels are used mostly for students from the small communities attending high school in the large ones.

Among adults, education levels are highest in the developed communities. Children who grew up there had schools available to them, unlike children raised in the small settlements or in hunting camps. Moreover, educated natives from the small settlements often migrated as adults to the larger ones in search of jobs. If formal education transmits knowledge about the nature of the body and the causes of disease, in

addition to reading, writing and other employment-related skills, then it should exert a beneficial influence on health and contribute to the positive association between economic development and native health. Thus it is hypothesized:

Hypothesis III: That there is a positive association between the amount of formal education received and health.

Wage employment

The federal government believes that natives' social and health problems are rooted in their poverty. It believes that the returns from traditional economic pursuits are insufficient and too precarious (due to vagaries in the weather, in the supply of game, and in fur prices) to support more than a minority of the native people. Therefore it actively encourages any economic venture which promises to provide wage employment for natives.

In the past, and in the N.W.T. today, there have been wide variations in the availability of wage employment. It is easy to obtain, if only seasonally, when a major construction project is underway. And in some years, or in some communities, there is virtually no wage employment to be had. The 1969-70 N.W.T. manpower survey conducted by the Department of Indian Affairs and Northern Development found that only a small minority of native men had had twenty-four or more weeks of wage employment in the preceding year. The employment rate varied widely, however, from 2% in Repulse Bay, a small Inuit settlement on Hudson's Bay, to 77% in Pine Point, a town built by Cominco to house its mine workers. Relatively high native wage employment rates were found in the large towns (Frobisher Bay, 58%; Inuvik, 50%; Yellowknife, 41%; Fort Smith, 41%; Hay River, 38%) as well as in a few smaller settlements. In Whale Cove, Chesterfield Inlet,

Pelly Bay and Resolute, more than 50% of the adult males had had twenty-four or more weeks of wage employment during the year. But, in contrast, one-half of all N.W.T. communities had native male employment rates of less than 25%.[44]

Some of the men designated as not being wage employed by the manpower survey were in fact full-time hunters who supported their families adequately. Nevertheless, the large number of native people receiving social assistance is evidence of the generally low standard of living among N.W.T. natives. A low income prevents the purchase of amenities--warm, spacious homes with modern water and sewage systems, recreational equipment, and so on--which make life healthier and more comfortable. A low standard of living also makes it difficult to retain the high morale necessary to bear up under the pressures and changes taking place in the North. For these reasons it is hypothesized in this study:

Hypothesis IV: That there is a positive association between the amount of wage employment held and health.

The Costs of Development

Witnesses before the Berger Inquiry attributed much of the social pathology in the North--the crime, violence, alcoholism, psychiatric illness, physical illness, destruction of morale and self-respect, family and community breakdown, dependence on welfare and so on--to the development process. It was these social costs, observed in other situations of rapid northern development, which led Berger to recommend a ten-year moratorium on construction of the Mackenzie Valley pipeline.

While many writers (as well as Inquiry witnesses) point to harmful consequences of development, both in the N.W.T. and elsewhere around the world, they often disagree about the precise causes of the harm, the precise

aspects of the development process which ultimately make life difficult and unpleasant for native people. The diverse explanations observers have advanced can be roughly categorized into four "theories"; the harmful effects are caused by: (1) the rapid rate of social and economic change; (2) the sudden close contact with an industrial culture; (3) the feelings of relative deprivation arising from the process of development; or (4) the emergence of a social structure in which natives have become a powerless underclass dominated by whites. This study will test hypotheses concerning the first three of these explanations.

Rapid change

It has often been suggested that rapid change is a "general hazard" to the health of an individual. Rene Dubos, an eminent microbiologist, explains that a healthy person is one who has achieved a stable equilibrium with his external environment, both social and physical, and with his internal environment, including the micro-organisms living within him.[45] A sudden change in either environment can trigger a disease: " . . . change *per se* often acts as a pathogenic agent, irrespective of the nature of the conditions which are changed."[46] Thus even favourable changes, sudden improvements in life conditions, can be harmful.

This view is supported by a growing body of research linking the amount of individuals' "recent life change" with their chances of contracting tuberculosis, diabetes, and heart disease,[47] various diseases of children,[48] abnormalities of pregnancy,[49] and many other physical disorders. The Schedule of Recent Experiences (S.R.E.) used in these studies to compute "recent life change" scores, records favourable changes such as marriage, job promotion and sudden financial gain as well as unfavourable changes.[50]

Psychiatric health is also thought to be impaired by rapid change.

Parkes claims that changes which take place in a short period of time and affect large parts of the individual's "assumptive world" can precipitate a mental breakdown.[51] Studies using the S.R.E. have found an association between life change and psychopathology[52] and, in addition, the tendency for mental health to improve when the rate of life change slows and to worsen when the rate of life change speeds up.[53] Geographical mobility, which often involves a wide range of life changes for an individual, has frequently been linked to mental illness.[54] Bloom suggests that the high incidence of psychopathology among Alaskan Inuit women can be partly explained by their high rates of migration from rural to urban communities.[55] Krush, discussing the deleterious effects of residential schools on Indian students, places part of the blame on "psycho-social nomadism", " . . . a condition which obtains when the child is exposed not only to repeated changes in locus but to repeated changes in the constellation of his meaningful persons."[56]

If rapid change is harmful to individuals, it may partly be due to the disintegration it produces in the social groups of which they are members. Social disintegration--the falling apart of stable networks of social relationships, the erosion of shared, clearly defined beliefs, values and rules of behavior--is likely to occur when there are sudden changes in a community's economic base, in the relative economic positions of the members, in the ethnic composition of the community, in the size of the community and so on. High rates of out-migration for health reasons, to attend school or to look for work elsewhere, and in-migration if a development project is established in a community, are also likely to cause community disorganization.

Research in other settings would suggest that social disintegration

is an underlying cause of the social pathology in the N.W.T.: Durkheim's study of anomie and suicide,[57] the Leighton's study of social disintegration and physical and mental illness in Nova Scotia,[58] studies of family breakdown and stroke mortality,[59] broken or absent "love links" and tuberculosis,[60] "value polymorphism" and psychopathology,[61] family cohesion and child health,[62] supportive family ties and infant health,[63] and so on. These and similar studies support the contention, made by both Vallee and Williamson[64] and echoed by Berger[65], that social disintegration resulting from abrupt social changes is a major factor in northern natives' severe physical and psychological health problems.

While the pace of change has quickened throughout the entire N.W.T. in the past two decades, some regions and communities have experienced faster and greater changes than others, as can be illustrated with data from the 1961 and 1971 censuses.[66] Cape Dorset more than quadrupled its population over the decade, due to the migration of people from outlying hunting camps; Tuktoyaktuk, another Inuit settlement, grew less than 50% in the same ten-year period. Fort Resolution was more than two-thirds native in 1961 and nearly two-thirds non-native in 1971, indicating a heavy influx of whites during the 1960's. Fort Norman, in contrast, experienced a net loss of whites and became more completely a native community. While the percentage of Fort Simpson males employed in the industries of mining, manufacturing, forestry, construction, transportation, communication and finance totaled only 4% in 1978, in 1971 it was 25%. Rankin Inlet experienced during this period a drop from 54% in 1961 to 18% in 1971, after the nickel mine had closed. The community of Belcher Island in 1961 had an annual per capita employment income of only a few dollars. In 1971 it was $1200 per capita, an increase in real terms of

3300%. Eskimo Point, in contrast, gained $69 (in real terms), or 13%, to achieve a 1971 annual employment income of $617 per capita. Cambridge Bay, the site of extensive defence activity in the early 1960's, lost nearly $2000 in per capita employment income (white servicemen included), or $3168 per capita in real terms.[67]

In each of these aspects of development - population size, the percentage of whites in the population, the magnitude of employment income and the proportion of the labour force engaged in non-traditional work - some communities have experienced heavy growth, some have experienced little growth and some have experienced negative growth. Since rapid change is believed to be hazardous for physical and mental health and since observers have attributed native health and social problems to the massive changes, and consequent social disintegration, taking place in some parts of the N.W.T., it is hypothesized:

Hypothesis Va: That there is a negative association between the rate of economic and demographic growth in the community from 1961 to 1971 and health.

While most of the N.W.T. communities experienced economic and population growth during the 1960's, a few suffered economic declines. Negative growth may be as or more disruptive than rapid gains in income, industry or population. Therefore it is hypothesized:

Hypothesis Vb: That the association between the rate of economic and demographic growth in the community from 1961 to 1971 and health is curvilinear (an inverted U-shaped curve).

Acculturation.

A second explanation for northern natives' high rates of social

and health problems attributes them to the process of acculturation -- when native people come into contact with and absorb the modern industrial culture of Southern Canadians. Gradually, through daily contact with white people, through television, through participation in white-run schools, churches and work organizations, natives are coming to think and act less like their ancestors and more like whites.

The acculturation process is believed to involve severe stresses for native people and has been cited as an important factor in such native problems as suicide,[68] mental illness,[69] alcoholism,[70] academic failure,[71] and accidents.[72] Around the world researchers have found the Westernization of traditional peoples to be associated with increases in hypertension and various other physical diseases.[73]

There are probably several reasons why the acculturation process is stressful. If the values, standards of conduct, religious beliefs and customs of the modern culture conflict with those of his traditional culture, the native person may be left with an unclear idea of the goals he wishes to achieve, of the rules which should guide his behavior and of the ways he should handle all the various problems that arise in his daily life. He may, because of his immersion in two distinct cultures, hold simultaneously two conflicting images of himself and his place in the universe. This state, ego diffusion or the lack of ego identity in Erikson's terminology, carries with it high levels of anxiety and sometimes leads to mental breakdown.[74] It is thought in the long run to produce permanent personality defects in "marginal men", those living at the margins of two cultures and hence never securely within either of them.[75]

Acculturation is thought to be stressful also because it is a

potential source of family and community disintegration. The existence of different degrees of acculturation among family or community members can result in value conflicts and in disagreements about standards of behavior, leading to the deterioration and rupturing of social relationships. For example, young natives who have become acculturated at school are likely to have internalized a value structure and a world view that is vastly different from that of their parents. The intergenerational conflict that results is likely to weaken the family ties which have held the members together. Similarly, at the community level the existence of groups of natives with marked differences in their adoption of white Canadian culture (e.g., the Nunamiut, "people of the land" and the Kabloonamiut, "people of the white man" in Baker Lake)[76] is likely to be associated with lowered levels of community consensus and cohesion. For these reasons it is hypothesized:

Hypothesis VIa: That there is a negative association between the degree of acculturation and health.

But the relationship between acculturation and health may not be so simple. For example, acculturation may bring conflicts and stresses only for the native person who is semi-acculturated, with one foot in each camp. Highly acculturated natives may experience few internal conflicts because they are so completely integrated into the white culture. Thus a U-curve hypothesis is suggested:

Hypothesis VIb: That the degree of acculturation is associated with health in a curvilinear relationship.

But the extent to which acculturation produces health problems may depend on other factors. Hobart's study of Inuit infant mortality found variables indicative of acculturation to white ways to have different con-

sequences for infant health depending on the size of the community.[77] It is possible that acculturated natives may feel at home in highly-developed communities with large white populations, but alienated and perhaps even ostracized in traditional settlements where few whites live. Conversely, natives with a low level of acculturation may find life in the larger towns stressful and life in the traditional communities much more satisfying. Thus it is hypothesized:

Hypothesis VIc: That health is positively associated with congruence between the individual's degree of acculturation and the level of community development and acculturation.

The native person's level of education may be important. If as a child he has been prepared in school for extensive contact with whites and their culture, then he should be able to adapt more easily to them than someone with little or no formal education. Conversely a child with a lengthy education in white schools may be unprepared for life in the traditional native way[78] and may be unable to find acceptance in the native community if he attempts to abandon the white ways. Thus it is hypothesized:

Hypothesis VId: That health is positively associated with congruence between the degree of acculturation and the level of education.

Wage employment may also be important. Acculturation, the adoption of white culture and lifestyles, may be most stressful when the means to live as whites do are unavailable because of lack of wage employment. Acculturated natives with high-paying jobs may suffer few problems; acculturated natives with financial barriers preventing the satisfaction of goals and self-images they have drawn from the white culture may feel

extremely frustrated. Therefore it is hypothesized:

Hypothesis VIe: That health is positively associated with congruence between the degree of acculturation and the amount of wage employment.

Relative deprivation

The preceding hypothesis is suggestive of relative deprivation theory, which would attribute many native problems to a discrepancy between their economic expectations or aspirations and their actual achievements. Natives who for one reason or another feel entitled to a job and a high income but are unable to obtain them may become frustrated, angry or despairing. Alcoholism or mental illness may result.

A study of Philadelphia blacks found a strong association between mental illness and "goal-striving stress", defined as the discrepancy between a person's aspirations and achievements when he feels his chances of achieving his goals in the near future are low.[79]

Vallee in his study of Baker Lake, N.W.T., documents the inequality of wealth and the consequent resentment that results when wage employment is available to only a part of the potential labour force.[80] He also predicts that accelerated education programs in the community will result in even larger numbers of qualified Inuit chasing the few jobs available. This situation, he asserts in a later paper, underlies much of the mental illness, alcohol use and violent behavior of young Inuit males throughout the N.W.T.[81]

Feelings of relative deprivation can arise out of the development process in a number of ways. First, the federal government's emphasis on educating natives for wage employment, an essential part of its efforts in aid of economic development, may backfire if there is an insufficient

number of jobs for the native graduates. Second, development projects which are short-lived (e.g., construction of the Mackenzie highway, the Rankin Inlet nickel mine) provide jobs and high incomes only temporarily and this may cause native workers to develop appetites and aspirations which cannot be met after the projects end. Third, projects which employ native workers may produce feelings of relative deprivation in those left unemployed. Finally, projects which employ whites for skilled, highly-paid jobs but exclude natives from all but the menial and most poorly paid jobs may cause resentment not only among the unemployed but among the native employees as well.

It is hypothesized in this study:

Hypothesis VIIa: That health is positively associated with congruence between level of education and amount of wage employment.

Feelings of relative deprivation are likely to be strong among unemployed natives living in communities where jobs are available for many of their native friends and neighbours. Being unemployed should be less frustrating in communities with low native wage employment rates. In fact the rare native with a job in such a community may find himself completely accepted by neither the unemployed natives nor the whites, a situation which itself may be stressful. Therefore it is hypothesized:

Hypothesis VIIb: That health is positively associated with congruence between the individual's amount of wage employment and the rate of native wage employment in his community.

Other natives are not necessarily a native person's only reference group. He may make comparisons between his standard of living and the standard of living prevailing throughout the community as a whole, including that enjoyed by the white population. If he is unemployed in one of the traditional, less developed communities. Therefore it is hypothe-

sized:

Hypothesis VIIc: That health is positively associated with congruence between the individual's amount of wage employment and the level of economic development in his community.

Domination by Whites

In contrast to the theories attributing natives' problems to rapid change, acculturation and relative deprivation, a fourth point of view is gaining currency in the debate about northern development. Many observers, some natives among them, have begun to argue that the entire range of problems so prevalent in the North is the direct consequence of a social structure in which native people are dominated by whites. The N.W.T. is "the colony within" Canada[82], where southerners, including corporations, exploit for profit the lands and the peoples of the North. Natives find themselves as an underclass in a rigid colonial system, suffering the racial discrimination and powerlessness which are the lot of a conquered colonial people.

It will not be possible in this study to test hypotheses suggested by this point of view. The study relies on government-collected data and to date Canadian governments have not gone to the effort of gathering systematic information on racial discrimination, domination, repression and exploitation of native people. Hence, even though these may be important causal factors behind the serious social and health problems of northern natives, they are beyond the scope of this study. Only a brief outline of some of the elements of the "domination theory" will be presented below.

A caste system along racial lines is clearly observable in most N.W.T. communities.[83] The whites form a distinct occupational group;

they are the businessmen, the professionals, the white collar employees and the skilled workers. Nearly all have steady wage employment and good salaries. They live in spacious modern homes with the comforts available in the South, though most are transients who remain in the community only a few months or years. The native people, in contrast, receive their living from hunting and trapping, from social assistance and from occasional or seasonal wage employment. Fully employed natives mostly perform unskilled labour. The majority of the natives live in small crowded houses of poor construction which lack many of the comforts of the whites' houses. Natives are more likely to be permanent residents of the community.

There is little vertical mobility in the northern communities and, according to some observers, surprisingly little contact between the two racial groups.[84] Few natives have succeeded in elevating themselves into the more highly rewarded occupations and into the social and recreational life of the white population. Similarly whites rarely venture outside their own enclosed group. Showing a tendency to interact with natives only as required by their jobs. Close interracial friendships are few. In part this may be due to the natural reluctance of transients to invest effort to become established in the community, especially when there are cultural and language barriers to overcome; in part it is due to racism. In consequence, a northern community is in fact two communities, "two solitudes", huddled together in the cold Arctic.

Unfortunately the government does not publish data on the distribution of occupations and income by race in each of the N.W.T. communities. If that information were available, it would be possible to test the hypotheses that natives' health is negatively associated with the degree of

occupational segregation by race in the community and with the size of racial income differentials.

In the miniature caste society of a N.W.T. settlement, natives' position at the bottom together with the discrimination and lack of acceptance they experience in their contacts with whites, probably have serious consequences for their self-esteem and mental health.

Kardiner and Ovesey made the classic statement regarding the effects of racial discrimination in their 1951 book The Mark of Oppression. When an individual experiences discrimination regularly, he receives a negative image of himself through others' behavior toward him and internalizes it. His low self-esteem is experienced subjectively as "an ever-present and unrelieved irritant . . . that is painful in its intensity."[85] At the same time he feels an intense anger toward those discriminating against him. Since they have more power than he, he must be ever careful "to replace aggressive behavior which would be socially disastrous with more acceptable ingratiation and passivity."[86] Suppressed rage "may ricochet back on its author" and the self-hate which results is eventually expressed in a variety of destructive ways: psychosomatic illness, mental illness (especially depression), apathy, alcoholism, criminality and "living for the moment."[87]

Two recent studies have been undertaken to discover how Canadian Indians handle their "ethnic stigma"[88] or, in other words, how they "attempt to sustain a morally-defensible self-image"[89] when white regard them as moral outcasts. Both authors report that one common way in which natives protect themselves from the unpleasant effects of discrimination is to withdraw from contacts with whites. Williamson notes the regular use of the same strategy by Inuit, who erect "the amai screen" ("amai" is translated as "I don't know") when confronted by whites.[90] As the pace of

economic development quickens, bringing more whites into the northern settlements, native people are finding it increasingly difficult to insulate themselves from the discriminatory behavior and the prejudiced attitudes that cause such pain.

Berger commented on the association between racial discrimination and psychiatric illness among N.W.T. natives:

> It should be plain enough that one of the most pervasive social problems in the North today is the loss of self-esteem that many native people have experienced. It may be no exaggeration to speak at times of a despair that has overwhelmed whole families, even whole villages. I want this point to be well understood because it is integral to many of the social pathologies of northern people, and the problem must be faced if we are to develop a rational social policy for the future of the North.
>
> Many of us cannot easily imagine what it is like to be a member of a subject race. When you see your race, or a member of it, denigrated or insulted, then you too are diminished as an individual. The expression can be subtle and insidious, or it can be overt; it can be part of deliberate behavior, or it can be unintentional. The disorders that such discrimination involves cannot be eliminated by psychiatric, health and counselling services. Although such service may palliate the disease, they will never cure it.[91]

It is possible that the presence or absence of racial discrimination determines whether or not acculturation is damaging for native people. Acculturated natives adopt a white lifestyle, identify with whites and want to be accepted by them--to a greater extent than do less acculturated persons. Rejection and relegation to an inferior status is thus likely to be more traumatic, and more productive of serious emotional problems. Berreman, studying young Alaska Inuit, concluded that acculturation _per se_ is not the cause of their psychological disorders and destructive behavior but rather it is acculturation accompanied by failure to gain acceptance by the white agents of their acculturation.[92] A similar implication can be drawn from Kerckoff and McCormick's study of Chipewyan children. They report that identifying with whites is associ-

ated with personality disorder (e.g., fear of rejection, painful self-consciousness, loneliness and isolation, apathy and impotence, excessive worry about the future, etc.) mostly in those children who are unmistakably Indian in appearance and thus face great barriers to acceptance by whites. If an Indian child "looks white" acculturation does not have the same damaging effect.[93]

It is unfortunate that information on white-native relations in each of the N.W.T. communities is not available. It would be interesting to test the hypothesis that native health is negatively associated with the amount of racial discrimination in the community, or the hypothesis that an individual's health is negatively associated with the degree to which he is stigmatized by whites because of his race.

Observers who view northern development in terms of colonialism have documented the loss of power natives experience when southern whites move North.[94] From the early days of the whaling ships, fur trade posts and missions to the present era of oil and gas exploration and government welfare programs, the freedom of native individuals and communities to make decisions about important matters affecting their own lives has been steadily eroded. In any northern settlement, the events which shape native people's daily lives result mainly from decisions made in Ottawa, in Yellowknife, in corporation boardrooms. Even in local matters the white representatives of the churches, businesses and various government departments have an influence over affairs in the community greatly out of proportion to their numbers.

Endless examples can be provided to show how natives' lives are shaped not by their own will but by decisions made by whites. A new school opens and government officials inform families, even those living in far off hunting camps, that all children must be enrolled. Or seismic

exploration crews arrive in the settlement and begin blasting in prime hunting and trapping grounds. A government official arrives in the community with orders to establish a native co-operative to make handicrafts. Some new houses are built and the settlement manager selects the native families who will move in. A highway is built through the settlement, bringing white businessmen, workers and their families. Flows of traffic to and through the village increase substantially. Nurses begin to make regular housecalls to give vaccinations and to ensure mothers are providing proper care for their children. A relay station is built, providing television reception for the first time. A mine opens some distance from an Inuit settlement and the personnel manager selects several of the men to work there. They will commute back to visit their families on weekends. The settlement manager announces the community is to have a new local governing council, with elected members. The plan, drawn up in Yellowknife by white civil servants, does not include any provision for the present chief and band council.[95]

It cannot be denied that many events and programs of this sort provide benefits for native people, though social costs may result as well. But the net result of even well-intentioned efforts to improve native welfare is that the power to make their own decisions is lost. Unable to influence events, the native people have no choice but to accept whatever fate the civil servants, the politicians and the corporations decide for them.[96]

Powerlessness is soon converted to resignation and apathetic surrender, with the symptoms--"passivity, lack of interest, decrease in energy, difficulty in concentration, lack of motivation and ambition, and a feeling of helplessness"--psychologist Kehoe believes are "virtually

endemic" among northern natives.[97] Since they feel powerless to solve their problems, native people often don't bother to try. Instead they attempt to forget them by drinking heavily. (David McClelland and his associates have a theory linking alcoholism to unmet power needs.[98]) They become fatalistic, cease to prepare for the future and thereby compound their problems.

Powerless, native people are less capable of coping with the entire range of stresses associated with economic development. Rapid changes are disruptive and damaging because they are of external origin and are beyond the power of native people to predict and control. Changes sought and accomplished by the native people themselves would not have the same harmful consequences. The acculturation process might not be so destructive if natives had more control over it, if, for example, elders had the power to decide which aspects of southern Canadian culture were to be passed on to their children in school. Feelings of relative deprivation would not create frustration and despair if they were not also accompanied by feelings of powerlessness. If natives felt in greater control of their lives, they would be more optimistic about their chances of achieving their goals through their own efforts.

There is some evidence that the process of economic development does not have the same serious impact on native people if they are able to retain some measure of control over it. Native participation in community decision-making is an important variable in determining the magnitude of the social and health problems that accompany a development project, according to research conducted by anthropologists in the North. Norman Chance reports that community morale remained high, alcohol use and deviance low, after the Inuit settlement of Kaktovik, Alaska, began receiving wage

employment at a nearby DEW-line radar base.[99] He attributed the success of the transformation from a hunting-trapping economy to a wage economy partly to the fact that the Inuit retained complete autonomy in the community. For example, native leaders decided whether or not white workers at the base were to be allowed to visit the community. Balicki and Cohen point to the same factor, native autonomy, in explaining the relatively successful adjustment of Povvngnituk, Quebec, Inuit to the introduction of soap-stone carving as their major economic activity.[100] Other anthropologists, studying communities where the prevalence of alcoholism, mental illness and deviant behavior soared during periods of economic development, suggest that the absence of native self-government, together with general individual powerlessness, contribute to natives' problems.[101]

It is unfortunate that information is not available regarding power relations in each of the N.W.T. communities. It would be interesting to test the hypothesis that native health is positively associated with the size of natives' share of the decision-making power in the community.

Summary

The hypotheses tested in this study are drawn from the on-going debate about the impact of northern economic development on the health and well-being of native people. The major hypothesis is that economic development is associated with native health--directly, inversely, or in a curvilinear relationship. The remaining hypotheses deal with some of the factors cited by participants in the debate as the benefits or the costs of development. Is economic development beneficial because it results in improved health services, more education and more wage employment for native people? Is development harmful because it involves rapid economic and demographic

change, acculturation stresses, relative deprivation and the domination of native people by whites? Do the benefits outweigh the costs, or vice versa? The objective of this study is to provide answers for these questions.

Chapter III

MEASURING NATIVE HEALTH

The hypotheses stated in the previous chapter concern native health, defined broadly to include psychological health as well as physical health. In this study three variables - infant health, alcohol use and use of preventive health services - will be employed as dependent variables, representing the wide range of health problems common in the North.

The reasons for selecting these as dependent variables are outlined below. The data collection procedures of the P.I.M.M. study are then described, as are the methods used to operationalize the three dependent variables. Sources of measurement error are discussed and the intercorrelations among the dependent variables are presented.

Selection of the Dependent Variables

Infant health.

The hypotheses of this study are drawn from the literature on stress, psychiatric illness, alcoholism, apathy, crime and other symptoms of human misery so prevalent among northern natives. Why then use infant health as a dependent variable for testing these hypotheses? There are two reasons why infant health is a strategic variable for this purpose: (1) there are a number of direct physiological connections between an infant's health and the mother's emotional state during pregnancy; (2) more fragile than adult health, infant health is more easily damaged by parental neglect resulting from emotional suffering, psychiatric illness, alcoholism and apathy. If adults' psychological health is poor, their infant's

physical health is also likely to be poor.

There is now a large body of research documenting the effects of maternal stress during pregnancy on infant health. Complications of pregnancy, birth defects, small birth weight, infant morbidity and mortality have all been found to occur with unusual frequency among women who have suffered emotional and psychological problems during pregnancy.[1] Summarizing many of these studies, Ferreira presents six different hypotheses to explain their findings.[2] Each hypothesis posits that stress produces physiological changes in the mother's body which, crossing the placenta,have harmful effects upon the fetus. In other words, the mother's emotional problems may cause infant disease without damaging her own physical health.

In addition, if her emotional problems are severe enough to endanger her physical health, then the infant is even more at risk. Tuberculosis is a good example although virtually all maternal diseases will have adverse effects on fetal and infant health. Tuberculosis, like most infectious diseases, can be stress-related. While nearly all northern natives are exposed to tuberculosis bacilli, only a few individuals develop active cases of the disease. Stressful conditions seem to lower resistance and hence sometimes to be decisive in producing infection.[3] Today, with screening programs and anti-tuberculosis drugs, the disease is even more clearly a consequence of emotional and psychological problems. Nearly all northern natives are tested for tuberculosis and if they are found to be susceptible to the disease are placed on daily chemotherapy. But every year new and reactivated cases occur because some natives are negligent in taking their drugs.[4] It is likely that many of the defaulters are persons with emotional problems who cope by means of alcohol or apathetic sur-

render.[5]

If the tuberculosis patient is a pregnant woman, she is likely to have complications throughout the pregnancy and during delivery. Because she may be unable to nourish the fetus properly, the infant, if it lives, is likely to be small and sickly. After the child is born, she may have insufficient stamina and morale to provide the physical care and emotional nurturance it requires, a situation which may become even more serious in the event she is hospitalized.

The consequences for the infant are similar if the mother drinks heavily during pregnancy. She is likely to have many complications of pregnancy and to produce a small unhealthy child, partly because she is likely to be malnourished and partly because of several direct physiological effects of alcohol on the fetus.[6] Reviewing the literature on alcoholism and infant health, Green concludes that alcohol use may be one of the "less dramatic but more insidious causes of perinatal death and morbidity."[7]

Parental alcohol use damages infant health in the post-perinatal period as well. Parents who are heavy drinkers often neglect nutrition, sanitation, and normal preventive health measures, thus endangering their own and their childrens' health.[8] Schaefer, an experienced observer of health in the N.W.T., reports that alcohol use, resulting in child neglect, malnutrition and exposure, is a major contributor to infant disease and death among N.W.T. Dene and Inuit.[9] This opinion is echoed by the Northern Health Service in one of its annual reports.[10]

Parental mental illness is known to have the same effect as alcoholism: children are neglected and abused and consequently suffer more than an average amount of illness.[11]

Perhaps the major factor in child neglect is parental apathy, whether or not it is associated with alcoholism or psychiatric disorder. Many northern natives, faced with problems they feel to be insurmountable, have simply given up on life and abandoned their responsibilities. Their children suffer as a result.

Health personnel working with native people have long recognized this fact. Thus when the Canadian government carried out a major study of Indian infant mortality in 1962-63, an attempt was made to measure parental apathy and estimate its effect on infant health.[12]

Data were collected on each of the 5552 Indian children born alive in Canada during 1962. Seventy-five percent of these children were followed for a year by nurses of the federal medical service. The death rate for all Indian children was 80 deaths per 1000 births, for those followed up by the nurses 58/1000, and for the Canadian white population 28/1000. The best predictor of Indian infant mortality was the quality of child care received in the home. The death rate for children judged by the nurses to have received poor care was 116/1000, exactly double the death rate for the group as a whole. In contrast, children judged to have received good care had a death rate of 32/1000, close to that of the Canadian white population. The next best predictor was parental apathy, as judged by the government nurses. The death rate for children of apathetic parents was 101/1000. Somewhat weaker associations with infant mortality were found for "the improper use of family means" (97/1000), unsafe water supply (96/1000), poor sanitation (94/1000), substandard housing (91/1000), "abuse of alcohol" (83/1000) and overcrowding (82/1000).

Graham-Cumming, the author of this study, recognized that parental apathy is a key variable in the process leading to infant disease. Not

only are apathetic parents negligent in daily child care but apathy is an underlying cause of poor sanitary facilities and housing, especially when parents divert family income to less "proper" uses, such as alcohol.[13]

In conclusion, infants are in danger whenever their parents' lives become troubled. For when parents are faced with problems they cannot handle, they often react in ways - becoming physically ill or psychologically impaired, hitting out violently at friends and family, narcotizing themselves with alcohol, retreating into apathy - which have serious consequences for their own and their childrens' health. Infant health, because it is so fragile, is particularly endangered by these forms of maladaptive behavior.

Therefore infant ill-health is a useful indicator of parents' overall inability to cope with traumatic life conditions. It is in one respect even superior to direct measures of adult pathology, such as physical illness, mental illness, alcohol use and apathy, because to some extent these are alternative consequences of severe stress. Infant health is negatively associated with all of them, and is a useful variable for that reason.

Alcohol use.

The second dependent variable in this study is parents' alcohol use. There is still a debate about the etiology of alcoholism. Some theorists regard alcohol use as a component of culture; individuals learn to drink in much the same way they acquire other cultural traits. But alcohol is a sedative. It depresses the activity of the central nervous system, bringing about a state of tranquillity and release from tension and anxiety. Many persons consciously self-prescribe alcohol to achieve this state, to obtain temporary relief from the problems and pressures of life.[14] Chronic

heavy alcohol use can thus be attributed to particularly traumatic life conditions, conditions difficult for the individual to change, or adapt himself to in less damaging ways. If alcoholism is a serious problem in the North, it is because there are other serious problems there.

Use of preventive care.

The third dependent variable is parents' use of preventive health services, specifically prenatal and well-baby services. It is included for two reasons: (1) use of preventive care likely reflects parents' psychological or emotional health and is hence a useful indicator of it; (2) use of preventive services is a measure of parents' general propensity to use health services and thus can be used to estimate utilization bias in measures of infant health.

Continuing high infant morbidity and mortality rates in the North have led the Northern Health Service to place great emphasis on prenatal and well-baby care. These services are now easily accessible to nearly all native mothers in the N.W.T. However many mothers do not take advantage of them. As a result their pregnancies are not monitored, their children are not immunized, and they do not receive the benefit of the nurse's advice regarding nutrition, sanitation and child care.

Who are the non-attenders? Studies in the United States and Great Britain have found mothers who fail to utilize these services to display subjective feelings variously termed "alienation", "anomia", "powerlessness" and "hopelessness" and to have life histories characterized by instability and insecurity.[15] If the same is true for northern natives, then those conditions so prevalent there - apathy, alcohol use and emotional disorder - probably play a significant part in native underutilization of preventive health services and thus, indirectly, in infant mortality and

morbidity.

The second reason for examining natives' use of preventive health services is to estimate utilization bias in measures of infant health. Mothers with a low propensity to use prenatal and well-baby care are also likely to underutilize health services when their children are ill. Since the measures of infant health employed in this study are derived from official health records, children whose mothers rarely visit a doctor of nurse when they are sick will appear healthy, because there are few health records for them. This source of error can be partly eliminated by taking mothers' general tendency to use health services, as reflected by their attendance at prenatal classes and well-baby clinics, into consideration.

The Perinatal and Infant Morbidity and Mortality Study

The Northwest Territories Perinatal and Infant Morbidity and Mortality Study was carried out to ascertain the medical, nutritional and social factors producing high rates of infant morbidity and mortality among the Dene and Inuit of the N.W.T. All children born in the N.W.T. between April 1, 1973 and March 31, 1974 were included in the study. It aimed at collecting complete information on the health of each child, from the prenatal period to the end of the first year of life, as well as information about nutritional practices and the social and economic characteristics of the child's family.

Much of the health data was obtained from routine medical records generated in nursing stations, doctors' offices and hospitals whenever a visit for prenatal care, well-baby care, diagnosis or treatment was made. Two special surveys were undertaken during the year to gather the nutritional and sociological information: nurses conducted interviews with the mothers to find out about the family's nutrition and special interviewers from

southern Canada carried out the sociological interviews. Data on sensitive social variables, including parents' alcohol use, were obtained from white informants--priests, teachers, R.C.M.P. officers--familiar with the native population in the community.

The 1191 children born during the year were included in the study. They are categorized into four ethnic groups, Dene, Inuit, Mixed and White, for the purpose of this dissertation. Classed as Dene are children with both parents either Indian or Metis, children with an Indian or Metis mother and an Inuit father, and children with two Inuit parents, children with an Inuit mother and an Indian or Metis father, and children with an unmarried Inuit mother. Classed as mixed are children with one white parent and the other either Indian, Metis or Inuit. Classed as white are children with two white parents or with an unmarried white mother. With this classification scheme, 261 of the infants were Dene, 452 were Inuit, 383 were white and 95 were mixed. The first two groups are the focus of this dissertation.

Strenuous efforts were exerted to keep track of each infant for the full year, despite some population mobility within the N.W.T. and to the outside. As a result of these efforts, only 6 Inuit (1.3%), 18 Dene (6.9%), 42 white (11.0%) and 4 mixed (4.2%) infants were lost from the study.[16]

The accuracy of the health data is probably high though some mistakes, omissions and inconsistencies are inevitable in routinely collected health records, especially when many different people are involved in record-keeping. Some are more conscientious about filling in forms than others. Since medical and nursing practice is more art than science, personnel may differ, for example, in the way they assign diagnoses to

to illness episodes, especially when full diagnostic work-up is not possible. What is a bad cold to one practitioner may be mild pneumonia to another.

Errors and missing data are more of a problem in the interview data. Some Dene and Inuit mothers were out of the settlement when the interviewer arrived and some refused to be interviewed. A total of 51 Dene mothers (19.5%) and 50 Inuit mothers (11.1%) missed the sociological interview, while 53 Dene mothers (20.3%) and 34 Inuit mothers (7.5%) missed the nutrition interview. There is undoubtedly a non-response bias in the data as a result, since unmarried mothers and mothers from the larger, developed communities were especially likely to have missed the interviews.[17]

Even when the interviews took place, the native women were often unable to answer questions asked by the interviewer. There are many "don't know's" in the data. Some of these may have been defensive: the 51 Dene women and the 88 Inuit women unable to estimate the family's annual income may have hesitated to reveal to a white interviewer information which might eventually reach the white social assistance worker. However most of the "don't know's" probably occurred because the questions were in some respects foreign to the natives' lives. For example, it is difficult to estimate family income when it is derived from casual labour on a number of occasions, from unpredictable trapping profits and from intermittent welfare benefits, especially when annual income tax returns are not filed. It is difficult to state an occupation in such a case. Many questions on both interview schedules asked for precise time estimates: "How old was the child when you began to bottle-feed her?" Such a question might tax the memory of any respondent,

but perhaps would be more difficult for native persons, less accustomed to dividing time into careful units, than for whites.

In addition to these difficulties, the interview schedules contained inappropriately or ambiguously worded questions, which probably extracted many "don't know's" and blind guesses. Pretesting of the schedules might have eliminated some of these problems but no pretesting was carried out. This was compounded by the use of a number of different interviewers, each with only limited training, and by the necessity to conduct interviews through interpreters. Interviewers and interpreters probably attempted to reduce the ambiguity of the questions in ways that were not consistent from interviewer to interviewer, interpreter to interpreter. As a result different interviewers and interpreters probably asked what were in fact quite different questions. Random measurement error from this source is likely to be significant and to result in the attenuation of observed relationships among variables.

Specific measurement problems are discussed more fully in the sections of this and subsequent chapters which deal with the operationalization of variables.

Another limitation of the P.I.M.M. study, for the purpose of this dissertation, is that in cases of adoption, interviews were not conducted with biological mothers but with adoptive mothers. Among the Inuit, for whom the adoption of children is a widespread custom, at least 68 infants (15%) were adopted shortly after birth. The effects of the natural mothers' conditions of life on their own psychological and physical health during pregnancy and hence on their children's health have been lost as a result. In fact, distortions may occur if it happens that psychologically unstable mothers give up their children to more stable

women.

Operationalization of the Dependent Variables

Use of preventive care.

During the period of the P.I.M.M. study, each time a pregnant woman visited a nursing station or a doctor's office for a check-up, each time she attended a prenatal class, a prenatal record was generated and placed in her file. After pregnancy, each time she brought her healthy child for a check-up or for immunization, a well-baby record was generated. A measure of her use of preventive health services is her total number of prenatal and well-baby visits.[18]

Inuit women used these preventive health services most often, Dene women the least often. Inuit mothers paid an average of 8.4 prenatal visits and 9.0 well-baby visits, white mothers 7.9 prenatal visits and 5.4 well-baby visits, Dene mothers 5.1 prenatal visits and 3.9 well-baby visits.

In each group, but particularly among the Dene, there were mothers who failed to take advantage of these services. While 9% of the white mothers paid fewer than three prenatal visits, 12% of the Inuit mothers and 30% of the Dene mothers paid fewer than three visits. Among infants who survived their first year and did not leave the N.W.T., 17% of the white infants received no well-baby visits, compared to 10% of the Inuit infants and 30% of the Dene infants.

If the number of prenatal visits and the number of well-baby visits both reflect the degree to which a mother is conscientious about caring for the health of her child, then they should be positively correlated. The correlations, for those children who remained in the N.W.T. and survived their first year of life, are 0.30 for Dene and 0.18 for Inuit.

They are statistically significant (alpha = .05) but not very high.

There are several explanations for these small correlations. First, the mother's psychological state might easily change during the eighteen months from her first prenatal visit to the end of her child's first year of life. She might be conscientious at one point in time, apathetic a few months later or earlier. Second, health services might be more accessible to her at one time than at another during this period if, for example, she migrates from one settlement to another or if there are changes in the health personnel in her settlement. Third, health personnel may play a large part in determining how extensively she uses prenatal or well-baby care. For example, if she is not a conscientious mother, and the child is constantly sick as a result, the settlement nurse might decide to act *in loco parentis* and actively monitor the health of the child, insisting that he be brought in for regular well-baby visits. This mother's records would show few prenatal visits but extensive use of well-baby care.

This example illustrates a major limitation of preventive health care as an indicator of native parents' psychological health: decisions about the use of preventive care are often made not by the parents but by health personnel, especially when they feel the parents are neglecting their responsibilities. It is a deliberate policy of the Northern Health Service to maintain "at risk" registers in areas of high infant mortality; nurses are directed to seek out vulnerable infants and keep them under close surveillance. In the Keewatin district, during the period of the P.I.M.M. study, there existed a special visiting program in which nurses and trained Inuit community workers followed up each dhild for a year after its birth by regularly visiting its family at home.[19] It was not

possible for a child to escape immunization and check-ups, even i its mother was apathetic and negligent. In such instances the usual positive association between parents' psychological health and their use of preventive health services may not exist. In fact it may be negative.

Alcohol use.

The second dependent variable is parents' alcohol use. White informants were asked to make confidential assessments of each parent's use of alcohol according to a four-point scale: (1) never drinks, (2) drinks but is never intoxicated, (3) occasionally intoxicated, (4) often intoxicated. The mother's and father's scores were summed to create an index of family alcohol use.[20]

Table III-1 shows the distribution of alcohol use scores for the Dene and Inuit mothers and fathers in the study. Alcohol use is extensive, especially for Dene and especially for the males. Mothers' and fathers' use of alcohol are closely associated, with $\text{tau}_b = 0.67$ for Dene and 0.61 for Inuit. This may reflect shared drinking patterns within families or possibly a tendency for the white judges to assume them.

The validity of this measure is damaged by the presence of a large amount of measurement error. Judges undoubtedly differed in the ratings they assigned, in their way of distinguishing between "drinking" and "getting intoxicated" and between "occasionally" and "often." Priests and R.C.M.P. officers may have held quite different views on the seriousness of any given type of drinking behavior. In addition, these white informants may have had to make their ratings on the basis of very little or even faulty information. A northern settlement's social life is usually segregated, with whites and natives restricting their drinking to their own group. In fact natives probably have good reason to conceal

TABLE III - 1

Mother's alcohol use by father's alcohol use, Dene and Inuit

Mother's alcohol use	Father's alcohol use				
	Never drinks	Drinks but is never intoxicated	Occasionally intoxicated	Often intoxicated	Total
Dene					
Never drinks	13	22	10	0	45
Drinks but is never intoxicated	0	28	15	3	46
Occasionally intoxicated	1	1	39	13	54
Often intoxicated	0	0	1	12	13
Total	14	51	65	28	158
Inuit					
Never drinks	129	38	46	4	217
Drinks but is never intoxicated	0	27	22	1	50
Occasionally intoxicated	1	4	60	10	75
Often intoxicated	1	0	3	13	17
Total	131	69	131	28	359

their drinking from priests, policemen and other whites. Lack of information may have been more troublesome for informants from the large developed towns, where natives have more anonymity, than for informants from the smaller settlements.[21] Moreover, what is regarded as normal drinking behavior in large settlements with liquor stores might be considered a serious drinking problem in the smaller, more isolated communities. For these reasons this measure of alcohol use, though perhaps the best possible under the circumstances, contains a large portion of error. Observed relationships with other variables will thus be attenuated and possibl distorted.

Infant health.

The major dependent variable in this study is infant health. The immense body of health data compiled in the P.I.M.M. study makes it possible to trace the illness experiences of each child from the time of its birth until its first birthday. Every visit to a nursing station or a doctor's office, every hospital stay, was recorded along with the diagnoses of the diseases the child suffered. Some illness episodes never came to the attention of the health service, as for example when entire families, including infants, spent part of the year in hunting camps or when negligent parents ignored their children's illnesses. However, the frequency of unreported illness was probably less than for any other population in the country, due to the close supervision of native infant health by northern nurses.

With such a comprehensive body of data pertaining to infant health available, there are two strategies for developing measures of infant health. The first strategy is to select a number of partial indicators that summarize particular aspects of the child's health and illness experience and examine each separately. The second strategy is to combine

these particular indicators, each incomplete by itself, into a single composite index of infant health.

Both strategies are followed in this study. A total of four measures of infant health are constructed, three partial measures and a composite index. The partial measures are the total number of illness episodes experienced during the year, the total number of days spent as an inpatient in hospital or nursing station during the year and the average severity of the illness episodes experienced during the year. The composite index is constructed, according to a formula presented below, from the information contained in these and from information about mortality (whether or not the child died during the year) and the estimated duration of the child's illness episodes. In all, a total of five pieces of information go into the construction of the composite index. It will be argued that the composite index is the most valid measure of infant health by virtue of its completeness.

Number of inpatient days.

The first measure of infant health is the total number of days the child spent as an inpatient in hospitals or nursing stations, from the time of his discharge from hospital following birth to his first birthday.

It is an incomplete measure of health because it leaves out both mortality and the large majority of illness episodes which, treated on an outpatient basis, never require hospitalization. Excluding mortality seriously damages the validity of the measure: infants who died at an early age show up as extraordinarily healthy because they didn't live long enough to spend time in a hospital. Merely dropping them from the study, depriving it of the sickest infants, renders the resulting sample quite unrepresentative of the population as a whole. This problem has led

many researchers to search for composite measures combining morbidity and mortality.[22]

Because air transport in the N.W.T. is expensive and subject to the uncertainties of the weather, the Northern Health Service has had no choice but to place much emphasis on outpatient treatment in each isolated settlement. Evacuation to a hospital, where physicians are available, is a last resort. Hence only 8% of Inuit infants' illness episodes and 12% of Dene infants' episodes required hospitalization. A morbidity measure which excludes 90% of the morbidity is thus quite incomplete.

Moreover, it is not always true that illness episodes requiring hospitalization are more serious than those treated on an outpatient basis. Other factors also play a part in the decision to hospitalize. The availability of beds, the ease of transportation, the amount of experience the settlement's nurse has had in the North, the nurse's assessment of the mother's ability to provide special care for the child - all these might determine whether or not the child is admitted to the hospital. Children with several hospital visits are hence not necessarily less healthy than children who never enter a hospital.

The same factors probably also influence the child's length of stay in the hospital. In fact northern health personnel report that children from outlying settlements are routinely kept in hospital a few days longer to ensure that the illness is really over, that there will be no relapse necessitating an emergency flight back to the hospital. The extra stay in hospital, during the period of the P.I.M.M. study, averaged 3.6 days for Inuit infants and 6.8 days for Dene infants.[23]

The padding of length-of-stay for infants from the isolated, less

developed settlements produces a bias in this measure of infant health. Children from these communities will appear less healthy than they really are and the observed association between infant health and economic development will be biased in a positive direction.

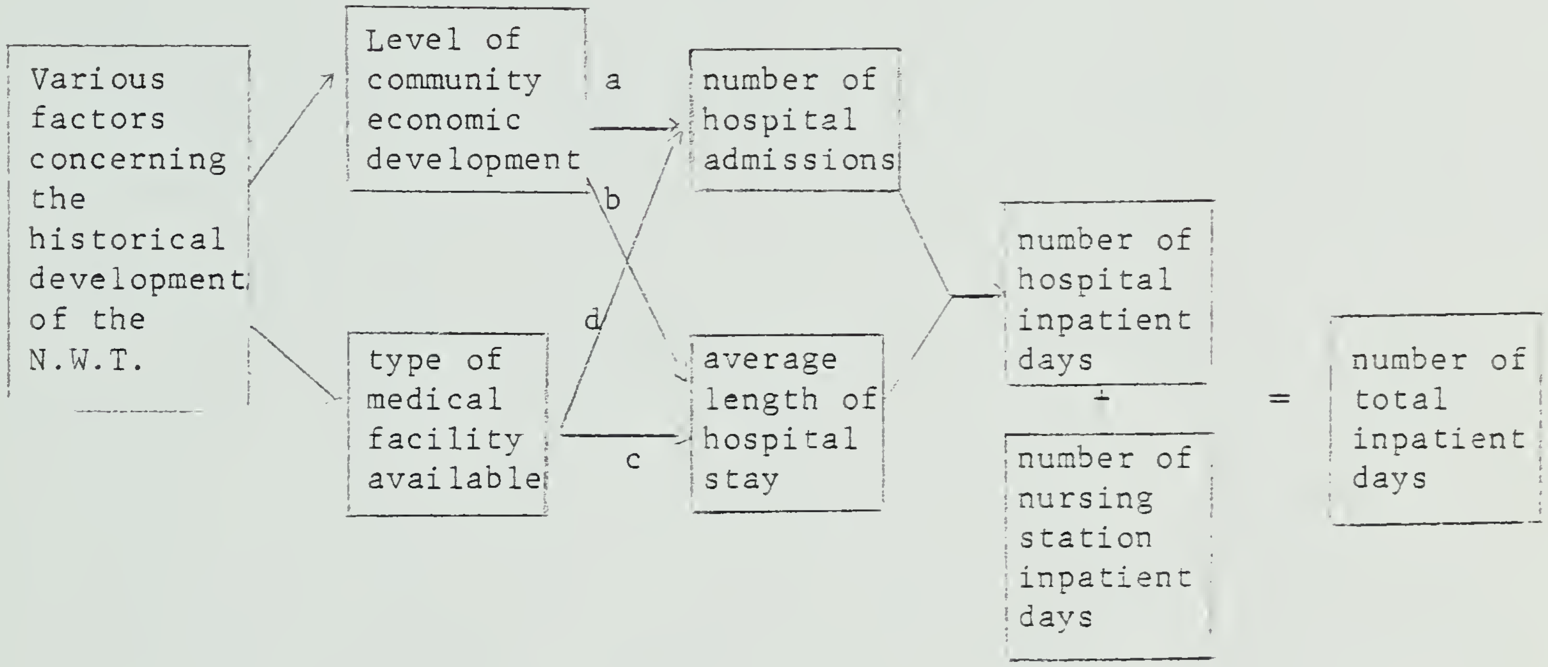
It is logical in such a situation to adjust the measure of inpatient days to remove that component of it which is due solely to whether or not the community has a hospital. One method might be to regress the number of inpatient days on the type of medical facility available, obtaining residual terms which can then be used as the adjusted measure of inpatient days.

Unfortunately this was not feasible because of the very high correlation (nearly unity) between the type of medical facility available and the composite index of community economic development. Such a high correlation occurred because, for a number of reasons related to the geography and historical development of the N.W.T. and its regions, all the large towns have hospitals and the considerably smaller communities have either nursing stations or health centres.[24] With such a high correlation, it is impossible to control for the type of medical facility in the community without removing all effects of the level of economic development on inpatient days - and thus rendering that measure of infant health useless.

Is there any way of reducing, if not totally eliminating, this bias in the measure of inpatient days? One solution is suggested by the causal model shown in Figure III-1.

First, it is possible to decompose the child's total inpatient days into those spent in hospital and those spent in nursing stations. In actual fact, very few days (less than one-half of one per cent of total inpatient days) were spent in nursing stations. Nurses apparently

Figure III-1


Various factors concerning the historical development of the N.W.T.
Level of community economic development
type of medical facility available
a
b
c
d
number of hospital admissions
average length of hospital stay
number of hospital inpatient days
+
number of nursing station inpatient days
=
number of total inpatient days

resisted using the nursing station beds for inpatient care, except for very short periods awaiting an evacuation flight.

Next, the number of hospital inpatient days can be decomposed into the two terms of which it is the product: the number of hospital admissions and the average length-of-stay in the hospital. It is the latter which is influenced so strongly by the type of facility in the community (path c in Figure III-1). The solution used in this study was to eliminate this effect by adjusting the average length-of-stay of out-of-towners to equal the average length-of-stay of children from communities with hospitals.

Bias remains, however, for two reasons. First, path b is removed (along with path c). That is, if the level of economic development has an effect on length-of-stay over and above that caused by the type of facility, it is lost. This will serve to make the estimate of the effect of economic development on inpatient days more conservative than it should be, (assuming that the effects of development on number of admissions and average length-of-stay are, with type of facility controlled, in the same direction). The second source of bias is path d, which is not removed. That is, if there is a tendency for children in communities with hospitals to be admitted to inpatient care more easily than children from communities without hospitals, then path d will be positive and sizable. The inability to get rid of it will make children from the larger communities appear sicker than they really are, in relation to children from small communities.

To summarize, the adjusted measure of inpatient days contains two biases and hence two tendencies (which may either cancel each other or strengthen each other), to make estimates of the effect of economic development more conservative and to make them more negative. It is

certainly debatable whether the adjustment procedure is in fact a "solution," whether it does result in a smaller bias than the unadjusted measure of inpatient days.

Number of illness episodes.

This measure is the total number of illness episodes experienced by the child during its first year of life. All episodes are included, whether or not they required hospitalization.

The data for this measure were collected from routine hospital records kept in the nursing stations, doctors' offices and hospitals. One or more morbidity contact records, containing the child's identification number, the date and a diagnostic code, were generated for each occasion on which a sick child came in contact with the health system. If upon examining the child the nurse or doctor assigned more than one diagnosis, then more than one morbidity contact record was generated. If the child was seen by a nurse or doctor on several successive days for the same illness, then a morbidity contact record was generated for each day he was seen. A single illness episode therefore typically resulted in a number of morbidity contact records.

It was thus necessary to develop procedures for identifying discrete illness episodes from the child's lengthy morbidity contact file. Two general rules of thumb were employed. First, if hospitalization occurred then all records generated during the hospital stay as well as those generated within three days prior to admission or within three days after discharge were grouped together as a single illness episode. If the treatment was on an outpatient basis, then all records generated within a time period (usually fourteen days) equal to the estimated average duration of the most serious diagnosis were grouped together as a single illness episode.

These rules appeared to accurately reflect the infants' illness experiences in the large majority of cases. However some exceptional cases probably were misclassified. For example, two illness episodes of short duration occurring within a short period of time were likely to be classified as a single episode. Conversely, a long-term health problem for which medical attention was received periodically over many months was likely to be classified as a number of short-term episodes of the same disease. In a few rare cases, chronically unhealthy babies afflicted by disease after disease in constant succession, the stream of morbidity contact records was divided into illness episodes in a rather arbitrary fashion. In general, these classification errors probably do not seriously damage the validity of the indicator as a measure of infant health.

However there are other properties of the indicator which seriously impair its usefulness. As with the inpatient days measure it omits mortality, with the same unfortunate consequences. Another shortcoming is that all illness episodes receive equal weight. For example, a month's stay in the hospital with meningitis registers the same degree of morbidity as a mild cold of three days duration. Failure to weight illness episodes in terms of their relative severity results in a measure of infant health which is very crude indeed.

Serious problems arise from this because of the damaging effects of utilization bias. The child whose mother takes him to the nursing station or doctor's office for every trivial complaint will appear to be much less healthy than the child who comes into contact with the health system only when seriously ill. If the propensity to utilize health services is related to the level of economic development, then a seriously biased estimate of the relationship between economic development and infant

health will be obtained if this measure of health is employed. As was the case with the number of inpatient days, the number of illness episodes is less than adequate as a measure of infant health because it is incomplete.

Mean severity of illness episodes.

The third measure of infant health is the average severity of the illness episodes the child experienced during his first year of life. Severity is measured on a scale from zero, signifying the state of complete health, to ten, signifying the state of death.

An attempt was made in this study to use the available information about each illness episode - the diagnosis or diagnoses given to it, whether or not it required hospitalization - to derive a measure of episode severity. To this end a sample of 28 Edmonton paediatricians was asked to rate the relative severity of fifteen diseases of infancy common among Dene and Inuit of the Northwest Territories.[25] They rated each disease on an eleven-point scale from zero to ten, for four different dimensions of severity: (1) the probability that the disease will be fatal if left untreated; (2) the probability that the disease will produce serious disability in later life if left untreated; (3) the average amount of pain and discomfort suffered by the child during the illness and treatment; and (4) the average amount of disruption of normal family life caused by the disease and the treatment. The paediatricians made separate ratings for two different age groups, infants less than one month of age and infants between one and twelve months of age.

The endpoints of each scale were defined for the respondents as follows:

(1) the probability of death: 0 = "no possibility of death", 10 = "death

is certain to occur", 5 = "50% chance of death", (2) the probability of serious disability: 0 = "no possibility of serious disability", 10 = "serious disability is certain to occur", 5 = "50% chance of serious disability", (3) pain and discomfort: 0 = "no pain or discomfort at all", 10 = "unendurable pain", (4) family disruption: 0 = "no disruption at all", 10 = "disruption equal to that which would have been caused by the death of the child."

Insofar as was possible, an attempt was made to define the two endpoints so that each scale would approximate a continuum from death to complete health. Then the value assigned to each disease would represent not only the relative severity of the disease but also the "healthiness", relative to the states of death and complete health, of a child who has the disease.

There was substantial agreement among the paediatricians regarding the relative severity of these diseases. The inter-judge reliabilities (computed using analysis of variance[26]) were very high, ranging from .92 for the pain dimension to .98 for the probability of death dimension. While in part these high reliabilities were due to the large number of judges, in part they reflect a general consensus among them.

Several paediatricians offered the advice that the four dimensions of severity are of unequal importance, that the first two dimensions should be weighted more heavily than the last two. One paediatrician chose a 4-4-1-1 scheme as the most appropriate one and it was adopted. Then a severity score was computed for each disease by taking the mean of the 28 paediatricians' ratings for that disease, each of the four dimensions weighted appropriately.[27] The resulting severity scores for infant diseases and health conditions are shown in Table III-2.

These severity scores were rounded to the nearest whole number, producing five classes of diseases with severity scores equal to 1, 2, 3, 4 and 8. A single paediatrician then assigned each infant disease not listed in Table III-2, those which occurred less frequently among northern natives, to one or another of those classes.[28] Thus every diagnostic code used by northern health personnel during the period of the P.I.M.M. study was assigned a severity score.

Illness episodes were then assigned severity scores according to the diagnoses present and according to whether or not they required hospitalization. When an illness episode had only a single diagnosis and did not require hospitalization, it was assigned the severity score for that diagnosis. However if it required hospitalization its severity value was increased by "1" on the assumption that illness episodes resulting in hospitalization are generally more severe than episodes of the same disease not requiring it. If the illness episode involved more than one diagnosis, then it was assigned a severity value equal to that of the most serious diagnosis plus "1" for each diagnosis with a severity score of 2.0 or more. For example, a six-month old child diagnosed as having otitis media, gastroenteritis and pneumonia all at the same time would have received for this illness episode a severity value of 5. If the episode required hospitalization, the severity value would have been increased to 6. An upper limit of 8 was arbitrarily imposed on any illness episode, in order to prevent a few multi-disease episodes from achieving a severity value equal to or greater than death.

Thus each illness episode a child experienced during the year was assigned a severity value ranging from 1 to 8, depending on the diagnoses involved and depending on whether or not the episode required hospitalization.

TABLE III - 2

Severity scores for infant diseases and health conditions, by age groups

Disease or condition	Severity score	
	Age = 29 to 365 days	Age = 0 to 28 days
Complete health	0	0
Upper respiratory tract infection	0.9	1.5
Stomatitis	1.1	1.3
Skin infections	1.1	1.3
Hernia	1.2	1.2
Bronchitis	1.4	1.9
Measles	1.9	*
Gastroenteritis	2.1	3.4
Pneumonia	2.4	3.6
Jaundice	2.6	2.4
Otitis media	2.7	3.0
Failure to thrive	2.8	3.3
Urinary tract infection	3.1	3.8
Congenital cardio-vascular lesion	3.4	4.3
Prematurity	*	4.2
Meningitis	8.0	8.4
Death	10.0	10.0

* No cases were reported in this age group.

If the child died during the year, an additional episode was coded with a severity value of 10. The mean severity of the child's illness episodes is a rough measure of his health during his first year of life.

There are several potential sources of error in this measure of health. First, there is considerable variation in severity among cases with the same diagnosis, variation which to a large extent is lost in this measure. Moreover, this intra-diagnosis variation made the paediatricians uncomfortable when they were asked the rate of severity of different diseases. They found it difficult to assign a probability of death to a particular diagnosis when the more severe cases with that diagnosis are often in grave danger and the milder cases in no danger at all. In fact the very idea of the "average" severity of a disease was foreign to them. This led many to express uncertainty about the rating procedure and to predict the survey would obtain very little agreement among paediatricians. But, as the very high reliabilities show, there was enough agreement for the purposes of this study.

A second possible source of measurement error is that paediatricians' severity ratings, while highly reliable, were based on their experience with an urban caseload consisting largely of white children. The relative severities of infant diseases might be quite different among natives of isolated northern settlements. For example, the harsh climate, the poverty, the substandard housing might substantially increase the probability of death for infants who come down with pneumonia. In short, the paediatricians' severity ratings may be reliable yet to some extent invalid.

Another possible source of error is the arbitrary method of adjusting severity values for those illness episodes with more than one diagno-

sis and for those which required hospitalization. It is likely, however, that the assumption upon which these adjustments are based, that severity increases with the number of different diagnoses involved and with hospitalization, is true in the majority of cases. Hence failure to make these adjustments would likely have resulted in even greater error.

Utilization bias is present in this measure of health. Infants who visit the nursing station regularly for trivial health problems as well as for more serious diseases will have a low average illness severity, as compared to those infants who receive medical attention only when seriously ill. It is important to note that the utilization bias in this measure is opposite in direction from the utilization bias in the previous health measure, the number of illness episodes. While the propensity to use health services is positively associated with the total number of reported illness episodes, it is negatively associated with the average severity of those episodes. This property will be useful in assessing the effects of utilization bias on the observed relationships between infant health and the independent variables in this study.

Finally, the average severity of illness episodes is less than adequate as a measure of infant health because it too is incomplete. It excludes the total number of illness episodes. Thus a child who experiences during the year a single illness episode of moderate severity will appear sicker than a child with a dozen moderately serious episodes and an additional dozen trivial episodes. The need to combine these two measures, the number of illness episodes and the severity of episodes, is clearly evident.

Mean duration of illness episodes.

A fourth partial measure of infant health is the mean duration of

the illness episodes experienced by the child during the year. Of little use by itself, this measure will be useful only as a component of the composite measure described later in this chapter.

The 28 Edmonton paediatricians were asked to estimate the average duration, from first onset to the complete return to biological health, of each of the fifteen common diseases of infancy listed above in Table V-2, under the assumption that treatment was undertaken successfully. They were much more comfortable estimating the duration of disease than severity. Their inter-judge reliability was .97, indicating substantial consensus about the length of time required to treat the different diseases of infancy. The estimated duration for each disease was then computed by averaging the doctors' estimates. A single paediatrician then provided estimates of duration for the less common diseases not included on the questionnaire.

An illness episode with a single diagnosis which was treated on an outpatient basis was assigned a duration value equal to the paediatricians' estimate for that diagnosis. If there were more than one diagnosis, the duration value assigned was that of the most severe diagnosis. If the episode required hospitalization, the adjusted length-of-stay[29] was chosen as the duration of the episode, except in the small minority of cases in which length-of-stay was shorter than the paediatricians' estimate. In those cases, the paediatricians' estimate for the most severe diagnosis was used, on the assumption that hospitalization occurred during only a part of the episode's duration. If the child died during the year, an additional episode was coded with a duration equal to 365 minus his age in days at death.

Mean duration of illness episodes, as a measure of infant health, has many of the same measurement problems as mean severity. Intra-diag-

nosis variation is lost as all episodes with the same diagnosis are assumed to have the same duration. Chronic health problems of long duration go unrecognized except when hospitalization is lengthy. The paediatricians estimated the length of time necessary to restore to health white paitents who live in Edmonton; their success under conditions in the North might not be achieved so quickly.

Composite index of infant health.

Each of the four measures of infant health described above is less than adequate because it is incomplete. The measure of hospital days excludes mortality and all morbidity which does not result in hospitalization. The number of illness episodes excludes mortality and considers all episodes equally, ignoring variations in severity and duration among episodes. The mean severity of illness episodes excludes the number and duration of episodes and is inadequate in its inclusion of mortality. The mean duration of illness episodes is of little use as a measure of infant health since it excludes both the number and severity of illness episodes.

The last measure of infant health is a composite index combining mortality and morbidity, with the morbidity component embracing not only the number of illness episodes but also their severity and duration. Because it is complete, this composite index is more valid as a measure of infant health than any of its components.

How is such an index constructed? The most common approach to constructing mortality-morbidity measures of health has been to conceptualize health as a continuum stretching from the state of death at one pole to the state of complete health at the other, then to define a number of intermediate health states lying between the two poles. In the case of infant health, for example, a child may be at home with a cold, at home with a mild case of pneumonia, in the hospital with a more serious case of

pneumonia, or in the hospital, in critical condition, with meningitis. Each of these health states would occupy a different location on the continuum. If it is possible to estimate how many days during the year a child spent in each health state and if it is possible to assign a value to each state representing its degree of health, then by summing these values across 365 days it is possible to obtain a total health score for the year or, dividing by 365, an average daily health score.

The controversial part of this procedure is in assigning health values to each of the different health states. Many mortality-morbidity indicators of health attempt to avoid this difficult problem by implicitly setting all morbid states equal in value to the state of death.[30] A more promising approach has been to try to measure the relative value or utility placed on each health state, including death, by members of the general population.[31] In the case of infant health, however, the general population is likely to be in ignorance about the probability of death and future disability, the amount of pain and family disruption caused by different diseases. Hence it is unlikely to be able to assess the relative utility of the different states of infant health. Paediatricians are in the best position to know the possible consequences of different diseases. Hence their estimates, the severity estimates described above, will be used as the "health" values for the infant health states.

Because most infants are in the state of complete health part of the year and a few are in the state of death part of the year, it is essential that the health values of the intermediate health states bear some logical relation to the values assigned to death and complete health. Thus, the endpoints of the severity scales were carefully defined so that "0" was associated as closely as possible with the state of complete health and "10"

as closely as possible with the state of death. It is very difficult to justify any scheme for assigning relative health values to death and the other health states but these values must be assigned, either explicitly or implicity, if mortality and morbidity are to be combined in a single index.[32]

The composite index is constructed according to the formula:

$$\text{Infant health} = (3650 - \sum_{i=1}^{k} (si)(di)) \times 10/365$$

where si is the severity of the i^{th} episode, di is the duration of the i^{th} episodes and k is the number of episodes the child experienced during the year. If the child died, an episode of death with severity equal to 10 and duration equal to 365 less his age in days at death is included. The result is an index ranging from 0, in the case of a child who died at birth, to 100, in the case of a child who was free of illness every day of the year.

According to this formula an illness episode involving ten days in the hospital with gastroenteritis and otitis media together contributes roughly the same deviation from health as seven separate week-long colds. Each of these has the same effect upon the health index as five days in the state of death. If these appear not to be equivalent, then the validity of the composite index is open to question.

The frequency distribution of this index for Dene and Inuit infants is shown in Table III - 3. The majority of infants form a large cluster between 90 and 100. They had relatively few illness episodes of short duration. A much smaller cluster, comprising infants who died early in the year, lies between 0 and 10. Few infants received health scores between 0 and 80. It should be noted that a health score of 80 denotes very poor health. As a rather unlikely hypothetical case, a child hospitalized with

pneumonia continuously for eight months, would receive a health score of 80.

The unusual frequency distribution of health scores points out a problem in the construction of the composite index. The outcome of a single early illness episode can have a profound effect on the child's health score. If upon contracting a serious disease the young infant hovers near death for a while, eventually to recover, his health score will be damaged only slightly. But if his defences are not quite so strong and he succumbs, his health score will be near zero. Disease severity, as well as the values of all variables affecting health, may be imperceptibly different in the two cases; health scores will be vastly different. As a result much of the variance in this index, that very large part contributed by the small number of deaths, may be unexplainable no matter what set of explanatory variables is employed.

On the other hand, the reverse may also be true. When the few early deaths contribute such a disproportionate share of the variance in the health index, a chance association between the occurrence of death and an explanatory variable, one which arises out of the small number of early deaths in the sample, can obscure the true association between that variable and infant health.

For these reasons it was judged necessary to reduce the proportion of variance in the health index contributed by the deaths. This was accomplished by establishing for the index a floor of 80. All cases with a health score less than 80 were adjusted up to 80.[33] This value was chosen because it marks a rough boundary between the health scores of children who lived and the scores of those who died. Only one death, an Inuit child, received a health score above 80 while less than three percent of those who survived

TABLE III - 3

Infants' scores on composite index of infant health

Health score	Number of Dene infants	Number of Inuit infants
0 - 9.9	7	23
10 - 19.9	1	3
20 - 29.9	3	4
30 - 39.9	3	4
40 - 49.9	0	1
50 - 59.9	0	3
60 - 69.9	1	1
70 - 79.9	2	13
80 - 84.9	11	20
85 - 89.9	26	50
90 - 94.9	51	158
95 - 100	138	166
TOTAL	243	446
(missing)	(18)	(6)
median	96	94
mean	90.2	86.5
standard deviation	19.7	23.3

the year received scores less than 80. Thus, even raised to 80, the health scores of children who died remained lower than the scores of children who survived. Mortality has not been eliminated from the index.

This arbitrary adjustment undermines to some extent the careful rationale given above for the construction of the composite health index. However, the index still remains more complete and hence more valid than any of its components. The adjustment procedure has simply minimized a potential source of false inferences.

Another advantage of the composite index of infant health is that utilization bias is minimized. The inclusion of severity weights in the index ensures that visits to the nursing station or doctor's office for trivial complaints have only a small effect on health scores. Similarly, the omission of unreported illness episodes, which tend to be of low severity, is less serious when severity weights are employed. Therefore, although utilization bias cannot be completely eliminated in any measure of health derived from utilization data, it is reduced to a minimum level in the composite index.

Intercorrelations among measures of infant health.

The intercorrelations among indicators of infant health reflect the fact that each measures a different aspect of the infants' health experience. Mortality has a negative association with the number of episodes and the number of inpatient days, simply because most of the deaths occurred very early in life. The 41 Inuit infants who died averaged 3.6 episodes and 4.5 inpatient days, compared to an average of 10.0 episodes and 11.1 inpatient days for the children who survived. The fourteen Dene infants who died averaged 2.6 episodes and 5.6 inpatient days, compared to an average

of 7.4 episodes and 11.3 inpatient days among those who survived. On the other hand, high positive associations exist between mortality and both mean severity and mean duration of illness episodes. This is largely because an episode of death, with high severity and high duration, was coded if the child died.

Table III - 4 shows the intercorrelations among the measures of infant health when the deaths are excluded. The composite index has a relatively high correlation with each of the other measures. The correlations among the three component measures are smaller. The low correlations between the number of illness episodes and the mean severity of illness episodes probably result from utilization bias. Overutilization produces an inflated number of episodes and a deflated mean severity of episodes while underutilization has the opposite effect. The lower correlation between these two measures among the Inuit indicates that utilization bias is a more serious problem in that group than in the Dene. That is, among Inuit there are much wider variations in parents' propensity to utilize health services and consequently more measurement error in each of the measures of infant health.

Table III - 5 shows the intercorrelations when infants who died are included. Note that the inclusion of deaths results in reduction in the correlations between the composite index and both the number of episodes and the number of inpatient days. This is to be expected because of the negative association between death and the latter two measures. It indicates that the number of episodes and the number of inpatient days are quite inadequate as measures of infant health when deaths are included in the sample.

The inclusion of deaths (Table III - 5) even produces negative cor-

TABLE III - 4

Correlations among measures of infant health
(excluding infants who died during the year)

	Number of illness episodes	Number of inpatient days	Mean severity of illness episodes
Dene (N = 229)			
Composite index of infant health	-.66	-.64	-.67
Number of illness episodes		.42	.28
Number of inpatient days			.50
Inuit (N = 405)			
Composite index of infant health	-.62	-.60	-.61
Number of illness episodes		.24	.09
Number of inpatient days			.46

TABLE III - 5

Correlations among measures of infant health (including infants who died during the year)

	Number of illness episodes	Number of inpatient days	Mean severity of illness episodes
Dene (N = 243)			
Composite index of infant health	-.36	-.45	-.74
Number of illness episodes		.43	-.10
Number of inpatient days			.14
Inuit (N = 446)			
Composite index of infant health	-.16	-.36	-.68
Number of illness episodes		.28	-.37
Number of inpatient days			.04

relations between the number and the mean severity of illness episodes, despite the fact that they are measures of the same variable, infant health. But some methodologists have remarked that it is often strategic, even necessary, to construct composite indicators out of components which are uncorrelated or even negatively correlated.[34] When each component covers a distinctly different aspect of the underlying construct, then each is a complement of the others, not a substitute. Thus the negative correlations among the components point out the incompleteness of each and the necessity of combining them into a single index.

Intercorrelations among the Dependent Variables.

Infant health is one of the three dependent variables employed in this study to represent the wider range of health and social problems among natives in the N.W.T. The others are alcohol use and the use of preventive health services. The three variables are expected to be closely associated since alcohol use, one of the common ways native people adapt to difficult life conditions, is believed to be an important cause of child neglect (including neglect of regular preventive health practices) and hence an underlying cause of poor infant health.

Table III - 6 and Table III - 7 present the intercorrelations among the measures of the dependent variables. Most striking is the small magnitude of the correlations: few are as high as 0.2. While the dependent variables may not be as strongly associated as expected, there are other possible explanations for the unusually low correlations. Random measurement error has undoubtedly attenuated each correlation. For example, the large amount of error in the measures of alcohol use are probably partially responsible for the small correlations involving those measures. In addition, systematic measurement error may be operating. If northern nurses

TABLE III - 6

Intercorrelations among measures of the dependent variables, Dene

	Number of prenatal visits	Number of well-baby visits	Use of preventive care (summated index)	Mother's alcohol use	Father's alcohol use	Alcohol use (summated index)
Dene (N = 150 to 243)[a]						
Mother's alcohol use	.13	.05	.12			
Father's alcohol use	.17	-.05	.09			
Alcohol use (summated index)	.15	.02	.12			
Infant health (composite index)	.07	.00	.05	-.21	-.25	-.22
Number of illness episodes	.17	.18	.22	.17	.21	.16
Number of inpatient days	-.15	-.24	-.20	.06	.13	.08
Mean severity of illness episodes	-.13	-.21	-.17	.14	.19	.18

(a) Correlations are based on different numbers of cases because of missing data.

TABLE III - 7

Intercorrelations among measures of the dependent variables, Inuit

	Number of prenatal visits	Number of well-baby visits	Use of preventive care (summated index)	Mother's alcohol use	Father's alcohol use	Alcohol use (summated index)
Inuit (N = 336 to 446)(a)						
Mother's alcohol use	-.14	-.12	-.18			
Father's alcohol use	-.08	-.09	-.12			
Alcohol use (summated index)	-.13	-.11	-.16			
Infant health (composite index)	.15	-.08	.10	-.06	-.03	-.06
Number of illness episodes	.15	.32	.29	-.19	-.15	-.19
Number of inpatient days	-.14	-.19	-.19	.13	.12	.14
Mean severity of illness episodes	-.19	-.16	-.23	.15	.10	.15

(a) Correlations are based on different numbers of cases because of missing data.

actively seek out "at risk" infants, then the number of well-baby visits as a measure of the mother's propensity to use preventive health services, is biased in favour of mothers whose children are unhealthy. The result is to destroy the expected positive association between use of preventive care and infant health. Utilization bias, as discussed below, can also result in artifically reduced correlations.

The expected negative association between alcohol use and preventive care occurred for the Inuit only. Among the Dene there was an inexplicable small positive association between alcohol use and use of prenatal care.

The association between preventive care and the composite index of infant health is very small for both Inuit and Dene. However, examination of the component measures shows this is partly due to utilization bias in the composite index. The number of illness episodes is positively correlated with the use of preventive care while the other components of infant health have the expected negative correlations with preventive care. This contrast is the result of utilization bias with its opposite effects on different components. Since the effect of utilization bias on the composite index will be negative (i.e. the higher the propensity to utilize health services, the lower infant health appears to be), the true correlation between infant health and utilization of preventive health services will be more strongly positive.

Utilization bias also affects the observed association between infant health and alcohol use. Among the Dene there is a moderately strong negative correlation between alcohol use and the composite index of infant health. Among the Inuit this correlation is virtually zero. But examination of the component measures shows that the differences between Inuit and Dene

in this regard are exaggerated by utilization bias. In the Inuit, alcohol users have a low propensity to use health services. (One result of this is the negative correlation between alcohol use and the number of illness episodes.) Utilization bias thus deflates the true negative association between alcohol use and the composite index of infant health. Just the opposite occurs for the Dene, among whom alcohol use is positively associated with use of health services. (Note the positive correlation between alcohol use and the number of illness episodes). Alcohol users' high propensity to use health services makes their children's health appear worse than it is. Thus part of the observed negative correlation between Dene alcohol use and infant health is caused by utilization bias. The true correlation would be smaller, though still negative. Therefore, adjusting for utilization bias reveals that the relationship between alcohol use and infant health is not as different in the two groups as it appears from the observed correlations.

Summary of the Chapter

Infant health was chosen as the major dependent variable in this study for two reasons. First, it is believed to be closely associated with the entire range of psychological problems apparently prevalent today among northern natives. Health personnel with experience in the North assert that alarmingly high levels of infant disease and death persist in the native population because of parental neglect resulting from alcoholism, apathy and psychological and physical disability. If this is the case, then infant health is likely to be a sensitive indicator of these problems.

The second reason for focussing on infant health is the availability of data. The Northwest Territories Perinatal and Infant Morbidity and

Mortality study has collected comprehensive health data for each child born in the Northwest Territories in the period from April, 1973 to March, 1974. The data's richness allows the construction of good measures of infant health. Moreover, the existence of data on parents' social and economic background makes it possible to test a number of hypotheses about the relationship between economic development and native health.

The P.I.M.M. study provides data on two variables, alcohol use and utilization of preventive care, which are usually associated with psychological health and which, therefore, will serve as additional dependent variables for this study. Unfortunately each is less than completely adequate for this purpose. The problem with alcohol use is measurement error. Native parents' alcohol use was assessed on a rough scale by white individuals who may or may not have been familiar with the behaviour they were asked to assess. The result is likely a high degree of random measurement error (and possibly even systematic measurement error) which will serve to attenuate and distort true relationships with the independent variables.

Utilization of preventive care has been found in other parts of the world to be negatively associated with anomie, alienation, alcoholism, mental illness and unstable life conditions. In the Northwest Territories, however, this might not be the case. Government health programs send nurses to actively seek out and monitor "at risk" infants. These programs probably reduce the degree to which use of preventive care for their children depends on parents' psychological state and, hence, on the usefulness of preventive care as a dependent variable in this study. In fact a more important use of this variable will be to estimate utilization bias in the measures of infant health.

Analysis of the P.I.M.M. data shows, as expected, that infant health is negatively associated with alcohol use and positively associated with use of preventive care, among both Inuit and Dene. Among the Inuit, alcohol use is negatively associated with use of preventive care but among the Dene, for some reason, the association is positive.

Chapter IV

THE BENEFITS OF DEVELOPMENT

The findings of this study are presented in two chapters, this one and the following one. This chapter contains the results obtained from testing Hypothesis I, concerning the overall relationship between economic development and native health, and Hypotheses II to IV, which deal with potentially beneficial aspects of the development process--more extensive medical facilities, higher levels of education and improved wage employment opportunities. Chapter V contains the results of Hypotheses V to VII, concerning the potential social costs of development for northern native people.

Hypothesis I. Economic Development and Health

Hypothesis Ia: That natives' health is positively associated with their community's level of economic development.

Hypothesis Ib: That natives' health is negatively associated with their community's level of economic development.

Hypothesis Ic: That natives' health is associated with their community's level of development in a curvilinear relationship (a U-shaped curve).

The major hypothesis and primary concern of this study is the overall relationship between the health of native people and community economic development. Are natives who live in the modern economically advanced towns healthier or less healthy than the residents of the smaller traditional settlements? The answer to this question is unknown at the present time; opinions of northern observers conflict sharply and there is little research to resolve the issue.

Measuring community economic development.

Differences between communities in their levels of economic development are obvious at a glance if one visits them. Some of the larger towns are scarcely distinguishable from towns in southern Canada. They are prosperous, contain industries employing many people, and hence display paved streets, office buildings, high rise apartments and supermarkets. Other communities consist of tiny houses or cabins huddled together, along with a few small buildings--the school, the nursing station, the Hudson's Bay store, the R.C.M.P. depot, the church and so on--that exist for the provision of basic services to the native population. The poverty in these settlements is apparent. It is clear too that the residents are of another culture and live in ways quite different from those of most southern white Canadians.

Defining "economic development" in such a way as to allow the precise measurement of community differences is not a straight-forward task, partly because the term is applied, in the N.W.T. and elsewhere, to a number of different but related processes. For example, "economic development" is often used to mean "economic growth"; hence a community's level of economic development can be measured by its per capita income. Or, the term can refer to structural changes in the economy of the community, such as a shift from hunting and trapping to mining and forestry or from the production of primary goods (fur, minerals and lumber) to secondary products (manufactures such as parkas) and tertiary products (personal services). With this definition, a community's level of economic development could be measured by examining the distribution of its labour force by industry and occupation. Thirdly, around the world development almost inevitably involves urbanization, as people who formerly derived their living from the land

migrate into the towns and cities. A relatively great concentration of population in urban areas appears to be both a consequence and a necessary condition for a high level of development. Hence an indirect measure of a community's level of development might be the size of its population. This is true, with a few exceptions, in the N.W.T.; small isolated settlements do not have the population base for a rich diversified economy. Fourthly, whites including southern corporations have provided much of the impetus for development projects. Thus the ethnic composition of the community, the percentage of the total population which is white, is an important factor in its level of development and another indirect measure of that variable.

These four aspects or dimensions of the development process--per capita income, industrial structure of the economy, population size and ethnic composition of the population--are measured in this study for each N.W.T. community, using census data. In addition, the four indicators are combined into a single composite index of community economic development. The composite index and all four of its components are used in testing Hypothesis I; the composite index alone is used as a control variable in testing the other hypotheses.

The first of the components is the community's per capita employment income. This is the total income earned by community members during the year, divided by the total number of residents fifteen years of age and older. It excludes unearned income such as social assistance payments but includes cash income from hunting and trapping as well as from wage and salary employment. It is important to note that income data published by the census is not broken down by ethnic group. Thus this indicator refers

to the income earned by both the white and the native populations in the community.

There was a wide range in N.W.T. communities' per capita employment income in 1971. Of the communities for which census data are available, the Inuit settlement of Paulatuk had the lowest annual income, a mere $117 per year. The poorest Dene settlement was Fort Liard, with $376 per adult per year. With very little employment income, the economies of these communities must have depended on welfare payments as well as upon the barter and sharing of country food, clothing and other goods. About one-half of the N.W.T. communities for which 1971 census data are available had per capita employment income less than $1000 per year. In contrast, Yellowknife's per capita employment income was $3332, exceeding the comparable figure for many southern Canadian communities. Several of the other large towns in the N.W.T. had a per capita employment income greater than $2500 per year. These data are shown, for both 1961 and 1971, in Table VI-1.

The second component of the index of economic development is the rate of industrial employment in the community. The census provides a breakdown of the community's employed labour force by industry--mining, hunting and trapping, and so on. The rate of industrial employment is the percentage of males 15 years and older who were employed more than six months in the previous year in one of the following industries: mining, forestry, manufacturing, transportation, communication, construction, finance and the personal service industries. The industries excluded were hunting and trapping, fishing, trade and the civil service. This measure combines two variables, the community's employment rate for males and the industrial structure of the economy, into a single indicator.

As shown in Table IV-1, several of the small native settlements had

TABLE IV - 1

Settlements of the Northwest Territories, economic growth, 1960 to 1970

Settlement	Annual per capita employment income, 1960 (dollars)	Annual per capita employment income, 1970 (dollars)	Rate of industrial employment 1960	Rate of industrial employment 1970
Belcher Island	26	1205	1	14
Repulse Bay	29	798	0	12
Gjoa Haven	45	531	0	0
Holman Island	60	778	0	29
Lac la Martre	62	1088	0	10
Fort Franklin	88	682	1	8
Snowdrift	110	531	0	7
Fort Simpson	118	1987	4	25
Wrigley	126	978	1	9
Fort Providence	144	974	4	14
Whale Cove	168	946	1	9
Rae	178	724	2	3
Lake Harbour	176	683	2	7
Fort Good Hope	179	916	2	2
Arctic Red River	202	1582	5	11
Fort Liard	226	376	1	3
Spence Bay	252	798	3	0
Igloolik	261	644	3	2
Fort Resolution	317	1004	9	14
Coral Harbour	321	1048	2	12
Clyde River	332	830	1	0
Tuktoyaktuk	333	1015	4	3
Pangnirtung	336	841	7	11
Fort McPherson	338	924	9	10
Coppermine	388	942	4	9
Eskimo Point	411	617	5	3
Paulatuk	470	117	0	0
Fort Norman	478	989	9	16
Cape Dorset	480	884	9	3
Baker Lake	487	1123	2	12
Aklavik	618	1130	13	13
Grise Fiord	628	1288	20	0
Arctic Bay	661	1170	0	10
Pond Inlet	661	798	0	0
Chesterfield Inlet	797	1374	33	24
Hay River	829	2469	22	28
Hall Beach	831	879	0	3
Fort Smith	1008	2207	26	23
Rankin Inlet	1370	1435	54	18
Inuvik	1414	2958	26	25
Frobisher Bay	1488	2845	24	26
Yellowknife	1576	3332	48	43
Resolute	1896	1375	33	22
Norman Wells	2564	3606	59	43
Cambridge Bay	3619	1660	6	9

no full-time employees in these industries in 1971; all the males who worked more than six months of the year were hunters or civil servants or traders. In contrast Pine Point, location of the Cominco Mine, had an industrial employment rate of 62%. Yellowknife, another mining town, had a rate of 43%. The average rate among the 51 N.W.T. communities was 13.7%, indicating a general shortage of year-round employment in these industries across the Territory.

The third component of the index of economic development is the size of the community's population. This was derived by taking the mean of two different population counts, the census enumeration of June 1, 1971 and an estimate provided by the Department of National Health and Welfare dated October 21, 1971.

The smallest Dene settlement included in this study was Colville Lake (42 people) and the smallest Inuit settlement was Paulatuk (87 people). Of the 51 communities, 23 (45%) had populations smaller than 300 and 7 (14%) had populations greater than 1000. Yellowknife was the largest with a population over 6000. The mean size of the 51 communities was 694 people, the median size was 369 people (Table IV-2).

The fourth component of the index of economic development is the percentage of the community's population which is non-native. As with population size, it was derived by taking the mean of the census and Department of National Health and Welfare estimates. Both estimates categorize non-status Indians and Metis, along with whites, as "other" or non-native. Many, however, regard themselves as more Dene than white and hence would be more appropriately classified as Dene. This misclassification produces significant error for only a few communities, Fort Resolution, Fort Smith,

TABLE IV - 2

Settlements of the Northwest Territories, population growth, 1961 to 1971

Settlement	Population size, June 1, 1961	Population size, June 1, 1971	Non-natives, % of the population, June 1, 1961	Non-natives, % of the population, June 1, 1971
Belcher Island	169	235	0	6
Repulse Bay	116	243	2	4
Gjoa Haven	98	262	1	6
Holman Island	100	275	3	6
Lac la Martre	121	174	3	6
Fort Franklin	238	390	2	12
Snowdrift	140	250	1	4
Fort Simpson	563	895	37	37
Wrigley	128	180	9	15
Fort Providence	402	616	13	27
Whale Cove	125	209	14	8
Rae	522	1031	10	10
Lake Harbour	90	184	9	6
Fort Good Hope	292	379	12	13
Arctic Red River	96	118	19	16
Fort Liard	154	267	12	8
Spence Bay	124	293	19	8
Igloolik	133	565	6	7
Fort Resolution	485	615	30	63
Coral Harbour	117	369	15	13
Clyde River	140	280	5	8
Tuktoyaktuk	409	598	10	10
Pangnivtung	114	679	15	6
Fort McPherson	509	756	26	22
Coppermine	230	674	15	9
Eskimo Point	168	633	13	8
Paulatuk	40	87	2	1
Fort Norman	189	245	33	23
Cape Dorset	150	609	14	6
Baker Lake	386	727	15	12
Aklavik	599	683	46	29
Grise Fiord	86	103	21	6
Pond Inlet	210	417	2	10
Arctic Bay	130	257	2	10
Chesterfield Inlet	146	266	35	13
Hay River	1338	2520	78	84
Hall Beach	66	225	0	9
Fort Smith	1681	2420	73	76
Rankin Inlet	585	580	25	12
Inuvik	1248	3310	67	72
Frobisher Bay	1426	2028	40	40
Yellowknife	3245	6395	90	90
Resolute	153	326	45	31
Norman Wells	297	260	89	86
Cambridge Bay	531	705	54	24

Hay River, which have large Metis populations.

According to these population counts, no N.W.T. community was entirely native in 1971 though many (22, or 43%) had less than 10% of their population classed as non-native. In contrast, Yellowknife and Pine Point were over 90% non-native, though some Metis and non-status Indians were included in those figures. Thus some communities were almost entirely native, others almost entirely white, and some (Inuvik, Frobisher Bay, Fort Simpson, Aklavik, Cambridge Bay, Fort Providence, for example) more evenly balanced in their ethnic composition (Table IV-2).

Tables IV-3 and IV-4 give the intercorrelations of these four measures for the 1971 and 1961 censuses. They were generally higher in 1971, with per capita income, the rate of industrial employment and the percentage of non-natives in the population having intercorrelations greater than +0.8. Population size is somewhat less highly correlated, since there exist small company towns (Norman Wells, Pine Point) which are quite prosperous and populated by whites as well as some fairly large native communities (Rae-Edzo, for example) with very little economic development. A reason for the lower intercorrelations in 1961 might be that the early 1960's was a time when some of the smaller settlements were receiving government services such as schools and mursing stations for the first time. Hence there may have been shortlived construction booms which gave wage employment and healthy paycheques to natives. By 1971 most of the basic government services were in place and hence government construction probably had less effect on local economies, particularly in the less developed settlements.

The four measures of economic development were combined into a single composite index by standardizing their frequency distributions and summing the standard scores. Before summing, however, lower limits of -3.0 and

TABLE IV - 3

Correlation coefficients, measures of community economic development, settlements of the Northwest Territories, 1971

N = 50 settlements	Per capita employment income (a)	Rate of industrial employment (b)	Population size (c)	Non-natives % of the population (c)
Per capita employment income	1.0	.85	.49	.84
Rate of industrial employment		1.0	.40	.83
Population size			1.0	.61
Non-natives, % of the population				1.0

(a) Average total employment income, males and females fifteen years and older, 1970. Source: Statistics Canada. User Summary Tapes. Enumeration Area Series (1971).

(b) Percentage of males fifteen years and older employed more than 24 weeks during 1970 in one of the following industries: mining, manufacturing, construction, forestry, transportation, communication, finance. Source: Statistics Canada. User Summary Tapes. Enumeration Area Series (1971).

(c) The mean of two population estimates: the census estimate for June 1, 1971; and an estimate provided by the Department of National Health and Welfare, dated October 21, 1971. The latter estimate was obtained from the University of Alberta Population Research Laboratory, Edmonton, Alberta.

TABLE IV - 4

Correlation coefficients, measures of community economic development, settlements of the Northwest Territories, 1961

N = 45 settlements	Per capita employment income (a)	Rate of industrial employment (b)	Population size (c)	Non-natives, % of the population (c)
Per capita employment income	1.0	.65	.39	.69
Rate of industrial employment		1.0	.55	.78
Population size			1.0	.73
Non-natives % of the population				1.0

(a) Average total employment income, males and females fifteen years and older, 1960. Source: printouts of the 1961 Census tables, University of Alberta Population Research Laboratory, Edmonton, Alberta.

(b) Percentage of males fifteen years and older employed more than 24 weeks in 1960 in one of the following industries: mining, manufacturing, forestry, transportation, communication, construction, finance. Source: printouts of the 1961 Census tables, University of Alberta Population Research Laboratory, Edmonton, Alberta.

(c) Census estimate, June 1, 1961.

upper limits of +3.0 were imposed, leaving the summated index with a possible range from -12.0 to +12.0. This procedure has the property of weighting the four components equally.

Results.

Is economic development beneficial or harmful for native health? Tables IV-5 and IV-6 present the correlations between the six measures of native health and the five measures of community economic development, for the Dene and for the Inuit.

Dene. There is a consistent positive association (Table IV-5) between community economic development and Dene infant health: the healthiest infants are in the most highly developed communities. Hypothesis Ia is supported. This relationship is not due to utilization bias, since parents in the developed communities show no tendency to use preventive health services more frequently than parents in the more isolated settlements. Alcohol use is heavier in the less developed communities despite the difficulty in those places of buying alcohol when there is no liquor store or beer parlour.

Inuit. The findings for the Inuit (Table IV-6) are quite different. While there is no association between economic development and the composite index of infant health, there are moderate associations with the number of illness episodes and the mean severity of illness episodes, both due largely to utilization bias. The strong negative association between economic development and use of preventive care indicates that mothers are more likely in less developed settlements than in the larger towns to bring their children to the nursing station, both for well-baby care and for rather trivial complaints. This practice results in a low average severity of the illness

TABLE IV - 5

Correlation coefficients, measures of community economic development and measures of native health, the Dene

N = 230 (a)	Economic development (composite index)	Per capita employment income	Rate of industrial employment	Population size	Non-natives % of the population
Infant health (composite index)	.31*	.29*	.29*	.26*	.31*
Number of illness episodes	-.35*	-.36*	-.32*	-.25*	-.37*
Number of inpatient days	-.20*	-.18*	-.23*	-.09	-.23*
Mean severity of illness episodes	-.18*	-.16*	-.15*	-.18*	-.19*
Use of preventive health services	.01	-.02	.05	.01	.00
Alcohol use (a)	-.10	-.04	-.06	-.19*	-.10

(a) Because of missing data regarding alcohol use, the sample size for correlation coefficients involving this variable is reduced to 194.

* Statistically significant, alpha = .05, two-tailed test.

TABLE IV - 6

Correlation coefficients, measures of community economic development and measures of native health, the Inuit

N = 441 (a)	Economic development (composite index)	Per capita employment income	Rate of industrial employment	Population size	Non-natives, % of the population
Infant health (composite index)	.00	-.01	.00	.04	.01
Number of illness episodes	-.22*	-.20*	-.19*	-.22*	-.22*
Number of inpatient days	.06	.07	.03	.04	.06
Mean severity of illness episodes	.16*	.17*	.15*	.12*	.15*
Use of preventive health services	-.42*	-.38*	-.30*	-.30*	-.43*
Alcohol use (a)	.23*	.27*	.22*	.14*	.21*

(a) Because of missing data regarding alcohol use, the sample size for correlation coefficients involving this variable is reduced to 393.

* Statistically significant, alpha = .05, two-tailed test.

episodes seen by the nurses, in comparison to the experience in the larger towns where utilization of health services is less regular, and a greater number of illness episodes reported. Since some utilization bias is still contained in the composite index, the true association between infant health and economic development is probably negative, though weak. Health personnel in the larger communities simply do not see as great a proportion of the infant health problems as do their colleagues in the less developed settlements. Hence, despite correlations of zero between the composite index of infant health and the measures of community economic development, there is probably slightly more infant disease in the larger settlements.

Alcohol use is also more common in the larger settlements. Thus all three health variables--infant health, use of preventive care and alcohol use--show a negative association between economic development and Inuit health. There is more evidence for Hypothesis Ib, among the Inuit, than for Hypothesis Ia.

But Hypothesis Ic, that health and development are associated curvilinearly, is also a possibility. This hypothesis is tested by regressing each health measure on the composite index of economic development, adding the square of the composite index of development to each equation, and examining the improvement in explained variance which results. If, as hypothesized, development is initially harmful because of its disruptive influence on the traditional social order but then becomes beneficial by improving the standard of living, then the sign of the squared term should be positive for the composite index of infant health and for the use of preventive health services, and negative for the other four health measures.

The results of this test are shown in Table IV-7. For the Dene the

TABLE IV - 7

Curvilinearity, Dene and Inuit health with community economic development

Dependent variables	Dene	(N = 230)$^{(a)}$	Inuit	(N = 441)$^{(a)}$
	% of variance explained by economic development (composite index)	additional % of variance explained by the square of economic development (composite index)	% of variance explained by economic development (composite index)	additional % of variance explained by the square of economic development (composite index)
Infant health (composite index)	9.44*	.03(-)	.00	.17(+)
Number of illness episodes	12.32*	1.84*(+)	4.98*	.29(-)
Number of inpatient days	3.98*	.95(+)	.36	.00
Mean severity of illness episodes	3.13*	.01(-)	2.70*	.07(-)
Use of preventive health services	.02	1.37*(+)	17.83*	.88(-)
Alcohol use (a)	1.05	1.02(-)	5.96*	3.97*(-)

(a) For the variable alcohol use, N = 203 Dene and 393 Inuit.

* The addition to R^2 is statistically significant, alpha = .05.

only evidence supporting Hypothesis Ic is a small but statistically significant increment to the explained variance in the use of preventive health services. A large increment, but with the wrong sign, is obtained for the number of illness episodes. There is more evidence of curvilinearity in Inuit alcohol use: alcohol use is low in the less developed communities, rises, but then plateaus as economic development increases. Infant health and use of preventive care are not, however, curvilinearly related to community economic development.

To summarize the findings of this study regarding the overall relationship between economic development and native health: development is clearly beneficial for Dene infant health, possibly slightly harmful for Inuit infant health; development reduces the use of preventive care among the Inuit but not among the Dene; development leads to heavier alcohol use among the Inuit but appears to prevent it among the Dene. Development is thus much more beneficial for the Dene than for the Inuit.

Despite the fact that only one aspect of health, Inuit alcohol use, is curvilinearly related to development, the contrasting results for the two native groups may be evidence of a more general curvilinearity. The Dene have, as a group, been exposed to whites and to wage employment for a longer period than have the Inuit. The Dene communities on Great Slave Lake and the Mackenzie River have known whites for a century or more; many Inuit did not come in contact with whites until well after the Second World War. It is perhaps this historical difference which accounts for the different patterns of health which exist between them.

Hypothesis II. Community Health Services and Health

Hypothesis II. That there is a positive association between the quantity of health services available in the community and health.

Part of the reason Dene infant health is better in the more highly developed communities might be the wider range of health facilities, notably hospitals and doctors' offices, available there. For Inuit, the slim negative association between economic development and infant health might in fact be stronger if medical facilities were more evenly distributed, if hospitals were not available only in the two largest towns, Inuvik and Frobisher Bay.

To test Hypothesis II, the communities of the N.W.T. were divided into three categories, those with hospitals (and doctors), those with nursing stations and those without trained health personnel at all. Tables IV-8 and IV-9 present the mean scores on each of the health measures for cases in each of these types of communities.

Dene. Dene infant health is better in communities with hospitals (Table III-8). There are fewer episodes of illness and the composite index of health is generally higher, despite a source of bias that would tend to reduce any positive association between the composite index and the quantity of medical services: infants tend to be hospitalized more frequently if there is a hospital in the community (raising the severity scores of illness episodes), despite the fact that the average severity of illness episodes is lower than in the communities without hospitals. Utilization bias is present, since mothers in the communities with nursing stations use health services with more frequency than mothers in communities with hospitals. The utilization bias has the effect of exaggerating slightly the difference in mean scores on the composite index between infants from communities with hospitals and infants from communities with nursing stations.

Inuit. Among the Inuit (Table IV-9), the use of preventive care is clearly

TABLE IV - 8

Dene health by the type of medical facilities available in the settlement

	No. health services (N = 17)[a]	Nursing station (N = 101)[b]	Hospital (N = 124)[c]
Mean score on infant health composite index	93.7	92.8*	95.2*
Mean number of illness episodes	6.8	8.6*	5.9*
Mean number of inpatient days	12.2	9.4	13.3
Mean average severity of illness episodes	2.6	2.5	2.3
Mean use of preventive health services	6.0	12.5*	7.0*
Mean alcohol use	4.7[a]	5.4*[b]	4.5*[c]

(a) For the variable alcohol use, N = 15.

(b) For the variable alcohol use, N = 91.

(c) For the variable alcohol use, N = 99.

* A difference-of-means test (t - test) showed statistically significant differences, alpha = .05, two-tailed test, when residents of communities with nursing stations were compared with residents of communities with hospitals.

TABLE IV - 9

Inuit health by the type of medical facilities available in the settlement

	No. health services (N = 9)[a]	Nursing station (N = 368)[b]	Hospital (N = 69)[c]
Mean score on infant health composite index	92.6	92.2	92.6
Mean number of illness episodes	3.9	10.0*	7.1*
Mean number of inpatient days	7.8	10.3	12.5
Mean average severity of illness episodes	2.7	2.4*	3.1*
Mean use of preventive health services	5.9	18.9*	9.8*
Mean alcohol use	5.8	3.8*	4.6*

(a) For the variable alcohol use, N = 4.

(b) For the variable alcohol use, N = 348.

(c) For the variable alcohol use, N = 44.

* A difference-of-means test (t - test) showed statistically significant differences, alpha = .05, two-tailed test, when residents of communities with nursing stations were compared with residents of communities with hospitals.

greater in settlements with nursing stations than in towns with hospitals. Thus utilization bias accounts for the statistically significant differences, in opposite directions, in the mean number of illness episodes and in the mean average severity of illness episodes. When utilization bias is taken into account, infant health appears to be slightly better in the settlements with nursing stations. The hospitals and the doctors in the large towns do not influence the level of infant health enough to make the towns healthier places to live for Inuit children.

Does the quantity and kind of health facilities in the community make any difference at all to infant health, or are the observed associations--positive for the Dene, weakly negative for the Inuit--simply spurious, due to the fact that the highly developed communities all have hospitals and doctors while the less developed communities do not? Is the contrast between the two groups due to differences in their abilities to make use of modern medical care or is it due to their different responses to the broader forces and conditions of economic development? Unfortunately these two variables, the level of community economic development and the quantity of health services available, are so strongly correlated that it is impossible to statistically partial out the effects on infant health of each. Hence it is difficult to reach any conclusions about the importance of hospitals and doctors as intervening variables in the relationship between economic development and infant health.

But, two pieces of evidence suggest that the quantity of health services available in the community does not in fact have a great influence on levels of infant health. First, prenatal and well-baby care is so much more extensive in the more isolated Inuit settlements with nursing stations,

compared to the towns with hospitals, that the closer health monitoring those infants receive must to a large extent compensate for any limitations in the nurses' ability to diagnose and treat their diseases. Second, patterns of parental alcohol use are very similar to the patterns of infant health: Dene alcohol use is lowest in the large communities with hospitals and doctors; Inuit alcohol use is high in those communities. But the existence or non-existence of medical services is not likely to be an important factor determining alcohol use; the associations are almost certain to be spurious. The same forces producing spurious relationships between alcohol use and the quantity of community medical services are likely responsible for the apparent, though contrasting, effects of differences in community medical services on infant health. Therefore, if economic development is influencing infant health, very little of that influence is likely to be due to the fact that more extensive health services are available in the more developed parts of the N.W.T.

Hypothesis III. Education and Health.

Hypothesis III: That there is a positive association between the amount of education received and native health.

Government policies for the improvement of northern natives' well-being have, since World War II, stressed education. Because natives living in the more highly developed communities generally have more years of schooling than residents of the more isolated settlements, education may be one of the important intervening variables contributing to a positive association, or preventing a negative association, between economic development and health.

The P.I.M.M. study gathered information on the number of years of

schooling obtained by the mother and father of each child. For the purposes of this analysis a single index was created by taking the average of the mother's and the father's years of schooling. In cases where information about the father's education was missing, the mother's years of schooling was used. The mean score on this index for Dene parents was 6.4 years of schooling, for Inuit 3.5 years. More than one-third of the Inuit infants (34.3%) were born to parents with no formal schooling at all, compared to 9% of the Dene infants. About 90% of the Inuit couples averaged fewer than nine years of schooling, compared to 70% of the Dene couples.

This index is an inexact measure of the kind and quantity of education received. It fails to indicate the level of education achieved (repeated years in the same grade were counted). Some students who were registered in day schools in fact attended school irregularly, sometimes staying away for months at a time when their families left for seasonal hunting camps. Also, those students who were educated in residential schools probably received a more thorough exposure to white ways and whites' knowledge than did day students. Thus this index of education is not a particularly valid indicator of the amount of time spent in school, the amount of contact with white teachers, or the amount of knowledge gained. It must suffice however.

Multiple regression analysis is employed to test Hypothesis III. Tables IV-10 and IV-11 present the regression coefficients, both unstandardized and standardized, for equations in which the health variables are regressed on education and community economic development. The first column gives the bivariate regression coefficients for the health variables on

education alone. The second column gives the partial regression coefficients for the health variables on education, when the composite index of economic development is included in the equations. The third column gives the regression coefficients when the health variables are regressed on community economic development alone. The fourth gives the partial regression coefficients for the health variables on economic development when education is included in the equations.

Dene. The first column of Table IV-10 shows a small positive effect of education on Dene infant health. For two of the measures of infant health, the number of illness episodes and the number of inpatient days, this effect is statistically significant. But much of the effect of education is shown to be spurious when the composite index of community economic development is introduced into the equations (column 2). The two significant effects drop to nonsignificance and the effect of education on the composite index of infant health changes from positive to negative. Education does not appear to be an important causal factor in Dene infant health.

Education does seem to increase the use of preventive health services, however, even when the level of community economic development is taken into consideration. Its effect on Dene alcohol use appears negligible.

Inuit. Table IV-11 shows similar findings for Inuit. Education has no effect on infant health, a small positive influence on the use of preventive care and, unlike the Dene, a small positive effect on alcohol use.

To sum up: Hypothesis III is not confirmed, either for Dene or Inuit. It does not appear to be the case that educated natives have

TABLE IV - 10

Unstandardized and standardized regression coefficients, Dene health regressed on education and community economic development.(a)

N = 196(b)	Years of education	Years of education controlling for economic development (composite index)	Economic development (composite	Economic development (composite index) controlling for years of education
Infant health (composite index)	0.16 (.11)	-0.06 (-.04)	0.49* (.31)	0.52* (.33)
Number of illness episodes	-0.27* (-.22)	-0.09 (-.08)	-0.46* (-.35)	-0.42* (-.31)
Number of inpatient days	-0.85* (-.19)	-0.56 (-.12)	-0.99* (-.20)	-0.70 (-.14)
Mean severity of illness episodes	-0.01 (-.03)	0.03 (.07)	-0.09* (-.18)	-0.10* (-.21)
Use of preventive health services	0.25* (.17)	0.30* (.21)	0.02 (.01)	-0.13 (-.09)
Alcohol use(b)	-0.03 (-.08)	-0.02 (-.04)	-0.05 (-.10)	-0.04 (-.08)

(a) Standardized regression coefficients are in brackets.

(b) For the variable alcohol use, N = 191.

* The regression coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE IV - 11

Unstandardized and standardized regression coefficients,
Inuit health regressed on education and
community economic development.(a)

N = 388(b)	Years of education	Years of education controlling for economic development (composite index)	Economic development (composite index)	Economic development controlling for years of education
Infant health (composite index)	0.01 (.01)	0.01 (.01)	0.01 (.00)	0.00 (.00)
Number of illness episodes	-0.05 (-.04)	0.00 (.00)	-0.30* (-.22)	-0.30* (-.22)
Number of inpatient days	0.42 (.08)	0.39 (.08)	0.29 (.06)	0.23 (.03)
Mean severity of illness episodes	0.01 (.02)	-0.00 (-.01)	0.08* (.16)	0.08* (.17)
Use of preventive health services	0.08 (.04	0.22* (.11)	-0.87* (-.42)	-0.91* (-.44)
Alcohol use(b)	0.08* (.16)	0.07* (.13)	0.12* (.24)	0.11* (.22)

(a) Standardized regression coefficients are in brackets.

(b) For the variable alcohol use, N = 382.

* The regression coefficient is statistically significant, alpha = .05, two-tailed test.

healthier children, even though they might be expected to have greater knowledge of health and disease as well as greater opportunities for wage employment and a high standard of living than less educated persons. While education does lead to increased use of preventive health services, this does not result in improved levels of infant health. Finally, education does not reduce alcohol use; in fact among the Inuit, drinking appears to be slightly heavier among the well educated.

Hypothesis IV. Wage Employment and Health.

Hypothesis IV: That there is a positive association between the amount of wage employment held and health.

During the P.I.M.M. study's sociological interviews, each mother was asked about her husband's occupation and about the number of months during the previous year he had been employed at a job which paid wages. Classed as hunters were men who hunted or trapped on a regular basis and did not have full-time wage employment during the year. They comprised 37% of the Dene fathers and 36% of the Inuit fathers. The remaining men were classed either as unskilled or semi-skilled labourers or as skilled or managerial workers, depending on the kind of work they did. Some men in the last two groups did not in fact receive any wage employment; their wives claimed for them occupations they were unable to pursue. Among all the Dene fathers, about 25% had no wage employment at all, 35% worked for wages for part of the year and 40% had year-round wage employment. Among the Inuit fathers, 17% had no wage employment at all, 44% worked part of the year and 39% had a year-round job.

Tables IV-12 and IV-13 show the mean scores on the health variables, together with the results of one-way analyses of variance, for the three

occupational groups. Tables IV-14 and IV-15 show regression equations in which the health variables are regressed on the father's number of months (from zero to twelve) of wage employment and on the composite index of community economic development.

Dene. Health is clearly worst among the Dene hunters and best among the Dene who have skilled or managerial occupations (Table IV-12). Three of the analyses of variance, for the composite index of infant health, for the number of illness episodes and for alcohol use, are statistically significant. Examination of the first column in Table IV-14 confirms that wage employment has moderately strong effects on all six measures of health. Three of the regression coefficients for infant health, including the composite index, are statistically significant. Health is best among those who work for wages and the more wages the better.

But when community economic development is controlled, much of this relationship disappears. The number of months of wage employment no longer has statistically significant effects on infant health. A spurious relationship has produced much of the bivariate effect of wage employment: if health is best among the employed, much of this is because the employed tend to live in the more developed communities. Other aspects of development, other intervening variables, must account for the statistically significant effect community economic development has on Dene infant health (Table IV-14, fourth column), even after wage employment is controlled.

Inuit. The results are somewhat different for the Inuit. Table IV-13 shows no tendency for health to be poorest among the Inuit hunters. They in fact have the lowest alcohol use and the least severe infant illness

TABLE IV - 12

Dene health by occupation

	Hunters (N = 59)	Unskilled or semi-skilled (N = 55)(a)	Skilled or managerial (N = 46)(b)
Mean score on infant health composite index	92.5*	94.4	95.7*
Mean number of illness episodes	8.7*	7.9*	5.4**
Mean number of inpatient days	11.7	13.0	6.7
Mean average severity of illness episodes	2.7	2.2	2.0
Mean use of preventive health services	8.7	10.5	10.0
Mean alcohol use	5.2*	4.9(a)	4.5*(b)

(a) For the variable alcohol use, N = 54.

(b) For the variable alcohol use, N = 44.

* One-way analysis of variance is statistically significant, alpha = .05, as is one Scheffé test of contrasts between occupational categories.

** The one-way analysis of variance is statistically significant, alpha = .05, as are two Scheffé tests of contrasts between occupational categories. (The occupational category with the double asterisk has a mean significantly different from the means of both other occupational categories).

TABLE IV - 13

Inuit health by occupation

	Hunters (N = 123)	Unskilled or semi-skilled (N = 158)(a)	Skilled or managerial (N = 54)
Mean score on infant health composite index	92.1	92.7	91.6
Mean number of illness episodes	10.9*	9.5*	9.7
Mean number of inpatient days	9.9	11.3	9.9
Mean average severity of illness episodes	2.1*	2.4	2.7*
Mean use of preventive health services	18.7	17.8	17.7
Mean alcohol use	3.6	3.9(a)	4.1

(a) For the variable alcohol use, N = 153.

* One-way analysis of variance is statistically significant, alpha = .05, as is one Scheffé test of contrasts between occupational categories. (The statistically significant contrast is between categories marked with a single asterisk).

TABLE IV - 14

Unstandardized and standardized regression coefficients, Dene health regressed on father's months of wage employment and on community economic development.[(a)]

N = 159	Months of wage employment	Months of wage employment controlling for economic development (composite index)	Economic development (composite index)	Economic development (composite index) controlling for months of wage employment
Infant health (composite index)	0.26* (.25)	0.14 (.14)	0.49* (.31)	0.39* (.24)
Number of illness episodes	-0.18* (-.21)	-0.05 (-.06)	-0.46* (-.35)	-0.42* (-.32)
Number of inpatient days	-0.50 (-.15)	-0.26 (-.08)	-0.99* (-.20)	-0.80 (-.16)
Mean severity of illness episodes	-0.06* (-.18)	-0.04 (-.13)	-0.09* (-.18)	-0.06 (-.12)
Use of preventive health services	0.14 (.13)	0.17 (.16)	0.02 (.01)	-0.10 (-.07)
Alcohol use	-0.04 (-.11)	-0.03 (-.08)	-0.05 (-.10)	-0.03 (-.06)

(a) Standardized regression coefficients are in brackets.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE IV - 15

Unstandardized and standardized regression coefficients, Inuit health regressed on father's months of wage employment and on community economic development.(a)

N = 360(b)	Months of wage employment	Months of wage employment controlling for economic development (composite index)	Economic development (composite index)	Economic development (composite index) controlling for months of wage employment
Infant health (composite index)	0.00 (.00)	0.00 (.00)	0.01 (.00)	0.01 (.00)
Number of illness episodes	-0.08 (-.09)	-0.04 (-.05)	-0.30* (-.22)	-0.28* (-.21)
Number of inpatient days	0.25 (.08)	0.23 (.07)	0.29 (.06)	0.23 (.05)
Mean severity of illness episodes	0.04* (.12)	0.03 (.09)	0.08* (.16)	0.07* (.15)
Use of preventive health services	-0.13 (-.10)	-0.02 (-.02)	-0.87* (-.42)	-0.87* (-.42)
Alcohol use(b)	0.04* (.10)	0.02 (.06)	0.12* (.24)	0.12* (.23)

(a) Standardized regression coefficients are in brackets.

(b) For the variable alcohol use, N = 353.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

episodes. In terms of the composite index of infant health, the poorest average score occurs for Inuit with skilled or managerial occupations. The number of months of wage employment does not have much effect on Inuit health (Table IV-15), especially when community economic development is controlled.

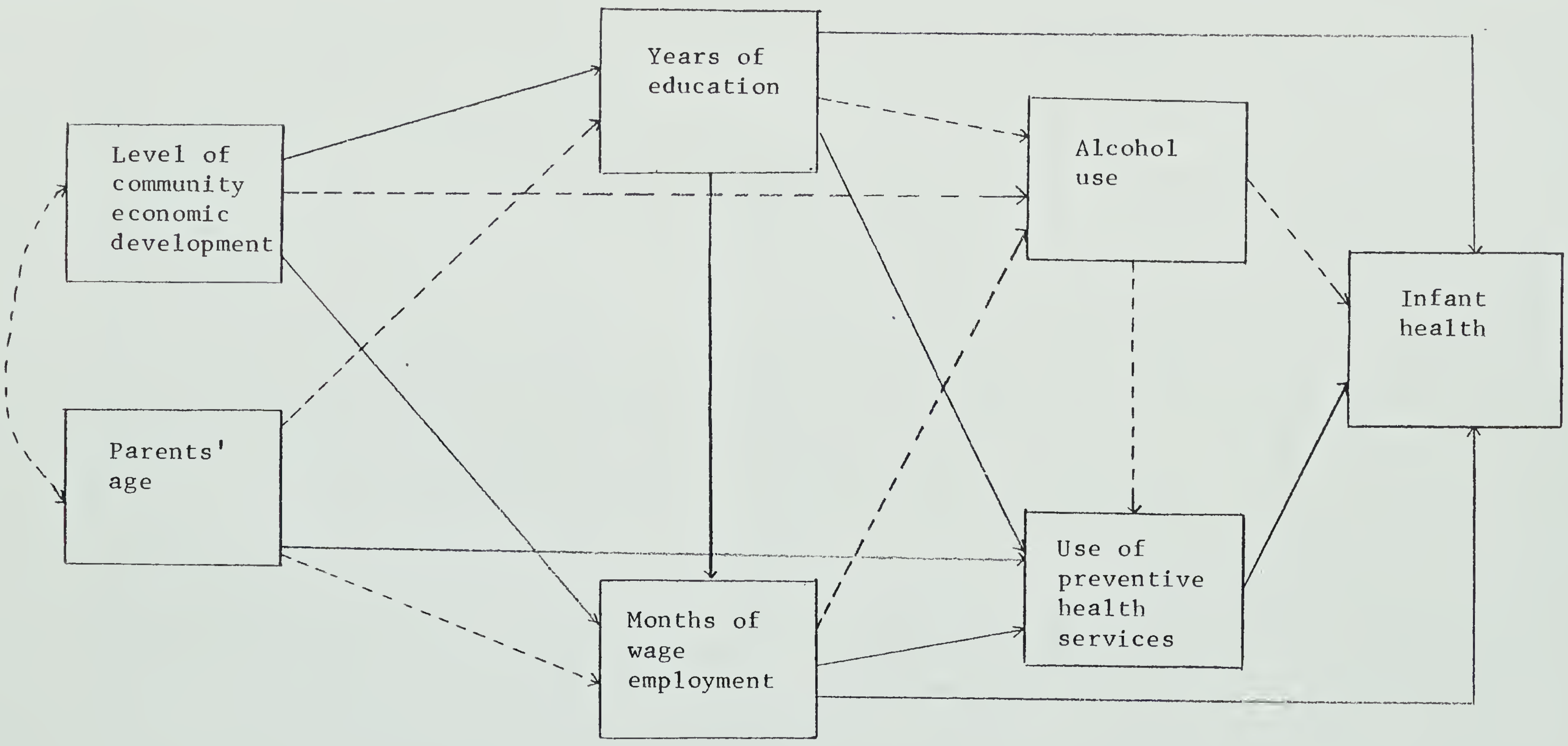
To sum up: there is slight evidence for Hypothesis IV for the Dene, none for the Inuit. A large part of the positive bivariate relationship between wage employment and health among the Dene is spurious, due to some other aspects of the development process, though a small (and statistically nonsignificant) positive effect remains after community economic development is controlled. Wage employment appears to have no effect, beneficial or harmful, among the Inuit.

A Path Model

According to the Canadian government and Canadian Arctic Gas, the benefits of development for native health include improved levels of education and increased employment opportunities. A causal model reflecting their view was outlined above on page 23 . Though a first look at the data indicates that education and wage employment do not have substantial beneficial effects, it is useful to test that model, on the off-chance that important causal effects have thus far been obscured.

It is necessary to modify the model before it is tested. First, one of the variables, the quantity of health services available in the community, must be dropped. It is so strongly associated with community economic development that the problem of multicollinearity can not be overcome. Second, the variable age--the average age of the child's two parents--is included as a general control. In some regions of the N.W.T.,

Figure IV-1. Path Model (revised from the model on page 23)


Level of community economic development
Parents' age
Years of education
Months of wage employment
Alcohol use
Use of preventive health services
Infant health

Legend: Solid arrows indicate hypothesized positive direct effects.
Broken arrows indicate hypothesized negative direct effects.

the different generations of natives have grown up in vastly different worlds. Hence parents' age is likely to be associated with all the other variables and to be a potential source of spurious effects. For example, younger parents more commonly reside in the developed towns, older parents more commonly reside in the less developed settlements. Effects of age on the other variables in the model, including health, might incorrectly be attributed to economic development if age is not included. In the path model, shown in Figure IV-1, alcohol use and the use of preventive health services are included as endogenous variables which are causally prior to infant health.

In specifying the model there is no basis, in either existing research findings or theoretical formulations, to suggest omitting any of the paths (except perhaps an extremely optimistic implication of the Canadian Arctic Gas position, that a positive association between development and health will fall to zero when wage employment is entered into the model). Therefore all paths, even those which turn out to be small, are estimated. The path coefficients (and unstandardized regression coefficients) are reported in Tables IV-16 and IV-17; the correlation matrices from which they were computed are contained in Tables IV-18 and IV-19.

Dene. Perhaps the most notable finding, from Table IV-16, is that the inclusion of four intervening variables and parents' age does not diminish the direct effect of community economic development on Dene infant health. The zero-order correlation between economic development and the composite index of infant health is +.31 (Table IV-18); the path coefficient remains almost as high, +.27. The benefits of development are apparently not the result of higher levels of education, more wage employment and higher

TABLE IV - 16

Regression equations, with unstandardized and standardized regression coefficients, to provide a path analysis with the following variables: Dene health, months of wage employment, years of education, parents' age and community economic development.(a)

Dependent variables	Independent variables							
N = 168 to 243(b)	Use of preventive health services	Alcohol use	Months of wage employment	Years of education	Parents' age	Economic development (composite index)	Constant	R^2
Infant health (composite index)	0.07 (.07)	-0.66* (-.20)	0.15 (.14)	-0.15 (-.10)	0.01 (.01)	0.43* (.27)	96.56	.154
Number of illness episodes	0.20* (.23)	0.25 (.09)	-0.05 (-.06)	-0.10 (-.08)	0.02 (.04)	-0.36* (-.27)	4.30	.198
Number of inpatient days	-0.80* (-.25)	0.90 (.08)	-0.04 (-.01)	-0.28 (-.06)	0.00 (.00)	-0.76 (-.15)	16.33	.112
Mean severity of illness episodes	-0.06* (-.20)	0.19* (.19)	-0.04 (-.13)	0.07 (.16)	0.00 (.01)	-0.08 (-.17)	1.72	.117
Use of preventive health services		0.46 (.14)	0.12 (.12)	0.41* (.29)	0.13 (.18)	-0.20 (-.13)	-0.28	.087
Alcohol use			-0.02 (-.08)	0.00 (.00)	0.01 (.04)	-0.03 (-.06)	4.76	.017
Months of wage employment				0.43* (.31)	0.01 (.01)	0.51* (.33)	3.05	.292
Years of education					-0.24* (-.48)	0.40* (.36)	13.62	.438

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix (Table IV - 15) constructed by the pair-wise deletion of missing values.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE IV - 17

Regression equations, with unstandardized and standardized regression coefficients, to provide a path analysis with the following variables: Inuit health, months of wage employment, years of education, parents' age and community economic development.(a)

Dependent variables	Independent variables							
N = 363 to 446(b)	Use of preventive health services	Alcohol use	Months of wage employment	Years of education	Parents' age	Economic development (composite index)	Constant	R^2
Infant health (composite index)	0.09 (.11)	-0.21 (-.06)	0.01 (.01)	0.04 (.02)	0.03 (.04)	0.10 (.06)	90.49	.016
Number of illness episodes	0.14* (.22)	-0.33* (-.13)	-0.03 (-.03)	0.04 (.03)	0.04 (.06)	-0.12 (-.09)	7.22	.115
Number of inpatient days	-0.51* (-.21)	0.98 (.10)	0.16 (.05)	0.53 (.10)	0.11 (.05)	-0.38 (-.08)	9.53	.061
Mean severity of illness episodes	-0.04* (-.16)	0.11* (.11)	0.02 (.07)	-0.05 (-.10)	-0.03* (-.14)	0.03 (.06)	3.72	.088
Use of preventive health services		-0.38 (-.09)	-0.02 (-.02)	0.49* (.23)	0.18* (.19)	-0.85* (-.41)	11.85	.220
Alcohol use			0.01 (.04)	0.07 (.14)	0.01 (.04)	0.11* (.22)	3.28	.077
Months of wage employment				0.20* (.13)	-0.10* (-.14)	0.24* (.16)	8.03	.093
Years of education					-0.26* (-.58)	0.09* (.09)	11.20	.354

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix (Table IV - 16) constructed by the pair-wise deletion of missing values.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

incomes, or the availability and use of preventive health services. Canadian Arctic Gas and the Canadian government are correct in their belief that development is beneficial for Dene health (at least infant health) but their reasons for holding this belief--the presumed benefits of education and wage employment--appear not to be sound. Other correlates of development, such as expanded medical services or improved sanitation, must be producing its beneficial effects. One possibility, tested in the next chapter, is that acculturation, the degree to which the attitudes, behaviors and lifestyles of white Canadians have been adopted by Dene, is a positive force promoting good health.

The level of education, though apparently without a direct causal effect on Dene infant health, is an important variable in determining the use of preventive health services. As one would expect, educated families are most likely to take advantage of prenatal and well-baby programs. Another notable thing about this finding is that it shows education to be a fairly powerful predictor of something, proving that the lack of an observed relationship between education and infant health is not due entirely to random measurement error or lack of variation in the indicator of education.

The amount of wage employment (and, hence, cash income) appears to have little effect, direct or indirect, on any of the measures of Dene health. While its path coefficients are all in the predicted directions, none are large enough to achieve statistical significance. Jobs and high incomes appear not to bring good health to the Dene.

Alcohol use has, as expected, a negative direct effect on infant health. There is also a puzzling small positive effect of alcohol use on

the use of preventive health services. The latter relationship might be explained in terms of acculturation processes not adequately reflected in the measures of education, wage employment and the level of community economic development.

Preventive health services are shown to have a beneficial effect on infant health, in spite of utilization biases in the measures of infant health. While the use of preventive health services and the number of illness episodes are positively related, because of utilization bias, preventive care does keep children out of hospital and has a positive net effect on the composite index of infant health.

A final comment can be made concerning the relatively low levels of explained variance achieved by the model. The multiple correlation coefficients for the infant health measures vary between .112 and .198. They are even lower for alcohol use and the use of preventive care. Extremely surprising, in the light of the conflicting testimony before the Bergen inquiry, is the finding that the level of economic development, education and wage employment account for virtually none of the variation in alcohol use, presently the most serious health problem in the N.W.T. Other variables must be at work. Some of them will be examined in the next chapter.

Inuit. The problem of poor explanatory power is even more serious for the Inuit data. Table IV-17 shows that the model explains less than 2% of the variance in the composite index of infant health. While the multiple correlation coefficients for the other three measures of infant health are slightly higher, this is due mainly to the effects of alcohol use and the use of preventive health services. Community economic development, edu-

TABLE IV - 18

Correlation matrix: Dene health, months of wage employment, years of education, parents' age, community economic development

N = 159 to 243[a]	Use of preventive health services	Alcohol use	Months of wage employment	Years of education	Parents' age	Economic development (composite index)
Infant health (composite index)	.05 (243)	-.22* (203)	.25* (168)	.11 (208)	-.03 (243)	.31* (230)
Number of illness episodes	.22* (243)	.16* (203)	-.21* (168)	-.22* (208)	.17* (243)	-.35* (230)
Number of inpatient days	-.25* (243)	.07 (203)	-.15* (168)	-.19* (208)	.07 (243)	-.20* (230)
Mean severity of illness episodes	-.17* (243)	.18* (203)	-.18* (168)	-.03 (208)	-.01 (243)	-.18* (230)
Use of preventive health services		.12 (203)	.13 (168)	.17* (208)	.03 (243)	.01 (230)
Alcohol use			-.11 (163)	-.08 (202)	.07 (203)	-.10 (191)
Months of wage employment				.45* (168)	-.23* (168)	.47* (159)
Years of education					-.56* (208)	.46* (196)
Parents' age						-.21* (230)

(a) Correlation matrix was constructed by the pair-wise deletion of missing values. N for each correlation is in brackets.

* Correlation coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE IV - 19

Correlation matrix: Inuit health, months of wage employment, years of education, parents' age, community economic development

N = 353 to 446[(a)]	Use of preventive health services	Alcohol use	Months of wage employment	Years of education	Parents' age	Economic development (composite index)
Infant health (composite index)	.10* (446)	-.06 (393)	.00 (363)	.01 (391)	.03 (445)	.00 (441)
Number of illness episodes	.29* (446)	-.19* (393)	-.09 (363)	-.04 (391)	.09 (445)	-.22* (441)
Number of inpatient days	-.19* (446)	.14* (393)	.08 (363)	.08 (391)	-.05 (445)	.06 (441)
Mean severity of illness episodes	-.23* (446)	.15* (393)	.12* (363)	.02 (391)	-.12* (445)	.16* (441)
Use of preventive health services		-.17* (393)	-.10 (363)	.04 (391)	.11* (445)	-.42* (441)
Alcohol use			.10* (353)	.16* (382)	-.08 (393)	.24* (392)
Months of wage employment				.24* (354)	-.23* (363)	.19* (360)
Years of education					.59* (390)	.15* (388)
Parents' age						.11* (440)

(a) Correlation matrix was constructed by the pair-wise deletion of missing values. N for each correlation is in brackets.

* Correlation coefficient is statistically significant, alpha = .05, two-tailed test.

cation, and wage employment have no appreciable direct effects, positive or negative, on Inuit infant health.

In contrast, the use of preventive health services is quite strongly influenced by these variables. Educated Inuit, older Inuit and Inuit from the less developed communities are the heaviest users of these services. All three of these direct effects are statistically significant though the direct effect of community economic development remains the strongest. It might be hypothesized that Inuit find the nursing stations in the smaller settlements less foreign and threatening than the hospitals and doctors offices of Inuvik and Frobisher Bay. It is also possible that nurses find it easier to actively supervise villagers' health needs in the smaller communities.

Community economic development and education have small positive direct effects on alcohol use. The effect of economic development, with a path coefficient of +.22, is statistically significant. Thus the zero-order relationship between these two variables, a correlation of +.24 (Table IV-19), remains largely unchanged when education, age and wage employment are controlled. Some other aspects of development, perhaps easier access to liquor outlets or acculturation, account for the relationship.

Summary.

Two major findings have emerged thus far. First, economic development appears to have quite different consequences for the two native groups. Among the Dene, development improves infant health, reduces alcohol use slightly and does not result in lower use of preventive health services. Among the Inuit, in contrast, development does not improve infant health.

Moreover it is associated with high levels of alcohol use and low rates of use of preventive care. Thus development is beneficial for Dene, harmful for Inuit.

The second noteworthy finding is that these effects cannot be explained by the variables, education and wage employment, believed by the government and Canadian Arctic Gas to intervene in the causal process. In every case the zero-order associations between the level of community economic development and measures of health remain stable when these two variables are controlled. Health differences between natives living in the more isolated settlements and those living in the developed towns are not attributable to differences in their levels of education or access to wage employment. Other factors are responsible for the observed effects of economic development on native health. Some of these factors will be examined in Chapter V.

Chapter V

THE COSTS OF DEVELOPMENT

Chapter IV presented findings regarding the overall relationship between economic development and native health in the N.W.T. (Hypothesis I) and regarding the potentially beneficial effects of medical services, education and wage employment (Hypotheses II, III and IV). Economic development was found to be positively associated with Dene health but negatively associated with Inuit health, relationships which turned out not to be attributable to effects, beneficial or otherwise, of medical services, education and wage employment. Why is there a sharp contrast between Dene and Inuit in the consequences of development? What factors are responsible for the effects of development on native health if the three obvious ones are not? These puzzling questions must be kept in mind as three hypotheses suggested by critics of the development process are examined. The hypotheses are that rapid change (Hypothesis V), acculturation (Hypothesis VI), and relative deprivation (Hypothesis VII) - all aspects or consequences of the development process - have damaging effects on native health.

Hypothesis V. Rapid Change and Health.

Hypothesis Va: That there is a negative association between the rate of economic and demographic growth in the community from 1961 to 1971 and health.

Hypothesis Vb: That the association between the rate of economic and demographic growth in the community from 1961 to 1971 and health is curvilinear (an inverted U-shaped curve).

Theorists have suggested that rapid change is a "general hazard" to both physical and mental health, a view which is supported by epidemiological

research in a variety of settings. Many observers of the North have remarked upon the massive changes taking place there as a result of the development process. Some have regarded high rates of suicide, mental illness, alcoholism and infant disease as indicators of the difficulty natives are having in adapting to rapidly changing social and economic conditions.

But the rate of development has been uneven in the N.W.T. Some communities have witnessed very rapid growth while in others the pace of change has been slower. In a few communities the decade from 1961 to 1971 saw an actual decline in the level of economic development. Might these differences in the rate of change be responsible for some of the observed variation, thus far largely unexplained, in native health in the N.W.T.?

The four measures of a community's level of economic development described in Chapter IV - annual per capita employment income, the rate of industrial employment, population size, and the percentage of non-natives in the population - are available for both 1961 and 1971 from census tapes. These data, presented above in Tables IV-1 and IV-2, can be used to test Hypothesis V.

There are unavoidable problems in doing so however. First, some changes which might have affected native health in 1973-74 when the P.I.M.M. data were collected are probably not reflected in the census results. The expansion of activity in oil and gas exploration from 1971 to 1974 is an example. Any short-lived construction booms, after 1971 or even in the mid-1960's, might have disrupted communities considerably but not have been recorded at either census. Conversely, a mild short-term improvement or decline in a community's economy, if it occurred at census time, would

cause the appearance of a more substantial change than had actually taken place. This is especially serious in the N.W.T. where community populations are often so small that the departure of even a single well-paid civil servant can cause a community's per capita employment income to drop by a sizeable percentage. Additional error arises from natives' lack of familiarity with and interest in the census and its questions. For example, questions about employment income over the preceding twelve months would elicit blank stares (and inaccurate responses) from natives who do not share governments' enthusiasm for precise, accurate statistical data. Census data for the N.W.T. are, in short, not very reliable.

Unreliability is particularly serious in the measurement of change. An observed difference, in per capita employment income from 1961 to 1971 for example, is a function of three things: the true change which occurred, measurement error in the 1961 data, and measurement error in the 1971 data. With two sources of error contained in it, a measure which involves taking a difference (sometimes called a "gain score") will be considerably more unreliable than either of its components. For N.W.T. census data this unreliability would be astronomical. It would be difficult, as a result, to detect relationships between change and health even if strong relationships actually exist.

This problem has been considered extensively by psychometricians. One of the procedures they have devised to reduce unreliability in the measurement of change is to regress the later scores on the earlier scores, deriving residuals which are then used as indirect measures of change.[1] This procedure, they claim, eliminates much of the error in the earlier scores from the measure of change.

Their procedure was used in this study. Each of the four 1971 measures of economic development was regressed on its corresponding 1961 measure. Then a positive or negative residual score was computed for each community for each of the four dimensions of development. These residuals were used as measures of the change which occurred from 1961 to 1971.

Regression analysis was then used to test Hypotheses Va and Vb. The health measures were regressed, in separate equations for each dimension of development, on the 1971 scores and the residuals. The improvement in explained variance achieved by adding the residuals to equations already containing the 1971 scores was calculated. A large improvement in explained variance indicates a strong relationship between the rate of change and health. Then, to test for curvilinearity (Hypothesis Vb), the squares of the residual terms were added to the equations and the additional explained variance was computed. The results of this analysis are shown in Tables V-1 and V-2, for the Dene, and Tables V-3 and V-4 for the Inuit.

If rapid growth is harmful, then the residual terms will have negative signs when added to the regression equations for the composite index of infant health and the use of preventive services. They will have positive signs in the equations for alcohol use and the three component measures of infant health. If the relationship between the rate of growth and health is curvilinear, with poor health occurring under conditions of very rapid growth and negative or very slow growth, then the squared residual terms will also have negative signs (signifying inverted U-shaped curves) when added to the regression equations for the composite index of

infant health and the use of preventive services. They will have positive signs in the equations for alcohol use and the three component measures of infant health.

Dene. As shown in Table V-1, growth in per capita employment income does not have harmful consequences for Dene health. In fact, as the signs in the left-hand column indicate, the rate of growth is positively associated with health, for all six measures of native health. In two of them, the number of illness episodes and the number of inpatient days, the association is statistically significant. In only one of the six measures, the use of preventive health services, is curvilinearity present. Rapid growth in community per capita income has been beneficial for Dene health.

Growth in the rate of industrial employment has not been so beneficial however (Table V-1). The rate of industrial growth is negatively associated with the composite index of infant health and positively associated with the mean severity of infant illness episodes. Both of these relationships are statistically significant. Alcohol use also appears more common in the faster growing communities, though this relationship is not statistically significant. None of the squared residual terms is significant.

Population growth is shown in Table V-2 to be slightly harmful for Dene. All six of the signs are in the hypothesized directions though only one, for the use of preventive care, is statistically significant. Curvilinearity exists between population growth and alcohol use: the fastest-growing and the slowest-growing communities have the highest rates of alcohol use. It should be noted that this squared residual term explains 4% of the variance in alcohol use, more than double that explained by the entire path

TABLE V - 1

Dene health and the rate of community economic growth, 1960 to 1970

N = 221(a)	Growth in per capita employment income		Growth in the rate of industrial employment	
	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)
Infant health (composite index)	0.04 (+)	0.00	1.78*(-)	0.03 (-)
Number of illness episodes	2.86*(-)	0.01 (+)	0.24 (+)	1.08 (-)
Number of inpatient days	2.38*(-)	0.00	1.13 (-)	1.05 (+)
Mean severity of illness episodes	0.31 (-)	0.31 (+)	3.05*(+)	0.43 (+)
Use of preventive health services	0.14 (+)	1.96*(-)	0.39 (+)	1.12 (-)
Alcohol use(a)	0.25 (-)	0.39 (-)	0.90 (+)	0.03 (-)

(a) For the variable alcohol use, N = 189.

(b) The additional explained variance resulting when the residual term (derived from regressing 1970 scores on 1960 scores for 45 N.W.T. settlements) is added to a regression equation containing the 1970 community employment income or industrial employment score.

(c) The additional explained variance resulting when the square of the residual term is then added to the regression equation.

* The increase in explained variance is statistically significant, alpha = .05.

TABLE V - 2

Dene health and the rate of population growth, 1961 to 1971

	Growth in population size		Growth in non-native % of the population	
N = 221(a)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)
Infant health (composite index)	0.34 (-)	0.04 (+)	0.52 (+)	0.45 (-)
Number of illness episodes	0.56 (+)	1.55 (-)	0.02 (-)	1.00 (+)
Number of inpatient cays	1.45 (+)	0.08 (+)	1.65*(-)	0.09 (+)
Mean severity of illness episodes	0.33 (+)	0.17 (-)	0.02 (+)	0.01 (-)
Use of preventive health services	2.25*(-)	0.24 (-)	0.34 (-)	0.78 (+)
Alcohol use(a)	0.61 (+)	3.97*(+)	3.00*(-)	1.86 (+)

(a) For the variable alcohol use, N = 189

(b) The additional explained variance resulting when the residual term is added to the regression equation.

(c) The additional explained variance resulting when the square of the residual term is added to the regression equation.

* The increase in explained variance is statistically significant, alpha = .05.

model discussed above in Chapter IV. Close examination of the data shows that the highest rate of alcohol use occurred in Fort Norman which gained only 56 people in ten years, due to a decline in the importance of the nearby Norman Wells oilfield. The second highest rate of alcohol use occurred in Fort Simpson, which experienced an economic boom and an increase of 332 people, or 59%, due to the construction of the Mackenzie Highway.

The rate of growth in the percentage of whites in the community is negatively associated with the hospitalization of infants and alcohol use. These relationships are strong enough to be statistically significant. Changes in the ethnic composition of the community which result in more whites thus appear to be beneficial, not harmful.

Inuit. Tables V-3 and V-4 display the results of this analysis for the Inuit. The rate of growth in per capita income is quite strongly associated with Inuit health, but not as hypothesized. There are two very large linear relationships: growth in per capita income explains 14.3% of the variance in the use of preventive care and 9.7% of the variance in alcohol use. Close examination of the data shows that the lowest use of preventive services and the highest alcohol use occurred in Inuit settlements--Cambridge Bay, Resolute, Rankin Inlet, Hall Beach--which experienced a declining income from 1961 to 1971 due to the phasing out of military activity and the closing of the Rankin Inlet mine. The rate of growth is positively associated with health because negative growth is harmful.

The same results are found, though more weakly, for infant health. Utilization bias is the cause of the statistically significant effects of the rate of income growth on the number and mean severity of illness episodes. There are fewer episodes, though of greater average severity,

recorded in the depressed communities because mothers' use of the nursing station is limited. Thus infant health will appear in those communities better than it actually is. There is a stronger positive relationship, then, between the rate of income growth and the composite index of infant health than there appears to be in Table V-3. The four statistically significant squared residuals reflect the fact that negative growth is more harmful than positive growth is beneficial.

Growth in the rate of industrial employment appears to be beneficial for Inuit, since the best infant health (composite index), fewest hospital days and lowest rates of alcohol use tend to occur in those communities experiencing the highest rates of industrial growth. All six signs are opposite in direction to what is hypothesized (Hypothesis Va). Only one squared residual term is significant: the use of preventive health services is highest in settlements with very low or negative rates of industrial growth as well as in communities with the highest rates of industrial growth. Neither Hypothesis Va nor Hypothesis Vb receives any support. Industrial growth is beneficial, not harmful.

A high rate of population growth is also not harmful for Inuit (Table V-4): The rate of population growth has a negative effect on alcohol use, a positive effect on the use of preventive care, and no effect at all on infant health. Though Hypothesis Va receives no support, there is slight support for Hypothesis Vb, since all six signs are in the directions hypothesized and two of the squared residual terms are statistically significant.

Growth in the percentage of whites in the community appears to have no relationship, linear or curvilinear, with infant health or the use of

TABLE V - 3

Inuit health and the rate of community economic growth, 1960 to 1970

	Growth in per capita employment income		Growth in the rate of industrial employment	
N = 414(a)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)
Infant health (composite index)	0.23 (+)	1.50*(+)	0.95*(+)	0.03 (-)
Number of illness episodes	2.30*(+)	0.05 (-)	0.58 (-)	0.62 (+)
Number of inpatient days	0.89 (-)	1.54*(-)	3.23*(-)	0.07 (-)
Mean severity of illness episodes	2.28*(-)	1.88*(-)	0.23 (-)	0.37 (-)
Use of preventive health services	14.30*(+)	0.13 (+)	0.03 (+)	4.03*(+)
Alcohol use(a)	9.73*(-)	1.90*(-)	2.08*(-)	0.67 (-)

(a) For the variable alcohol use, N = 372.

(b) The additional explained variance when the residual term is added to the regression equation.

(c) The additional explained variance when the square of the residual term is added to the regression equation.

* The increase in explained variance is statistically significant, alpha = .05.

TABLE V - 4

Inuit health and the rate of population growth, 1961 to 1971

N = 414(a)	Growth in population size		Growth in non-native % of the population	
	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)	% of variance explained, residual term(b)	% of variance explained, square of the residual term(c)
Infant health (composite index)	0.00	0.55 (-)	0.04 (-)	0.35 (-)
Number of illness episodes	0.03 (+)	0.05 (+)	0.05 (-)	0.03 (+)
Number of inpatient days	0.42 (-)	1.16*(+)	0.44 (-)	0.06 (+)
Mean severity of illness episodes	0.05 (-)	0.47 (+)	0.05 (+)	0.01 (-)
Use of preventive health services	1.56*(+)	1.83*(-)	0.00	0.36 (-)
Alcohol use(a)	1.76*(-)	0.69 (+)	11.02*(-)	0.52 (+)

(a) For the variable alcohol use, N = 372.

(b) The additional explained variance when the residual term is added to the regression equation.

(c) The additional explained variance when the square of the residual term is added to the regression equation.

* The increase in explained variance is statistically significant, alpha = .05.

preventive care (Table V-4). However alcohol use is strongly related. Very high rates of alcohol use occurred in the Inuit communities which lost fairly large white populations from 1961 to 1971: Cambridge Bay, Spence Bay, Resolute, Rankin Inlet and Chesterfield Inlet. This finding is consistent with similar negative relationships between alcohol use and the rate of growth for the other three dimensions of economic development.

To summarize: the rate of growth from 1961 to 1971 has had inconsistent effects on Dene health, with growth in per capita income and in the percentage of whites appearing slightly beneficial and growth in industrial employment and population appearing slightly harmful. Thus, overall, Hypothesis Va is not supported. There is also virtually no support for Hypothesis Vb. For the Inuit, the evidence is overwhelmingly against Hypothesis Va. Economic development appears beneficial, partly because the negative growth which took place in several Inuit communities during the 1960's has had serious consequences, particularly for alcohol use. There is also very little support for Hypothesis Vb. There is, in sum, little evidence that rapid economic and demographic growth has had the harmful consequences for native people that some observers have claimed.

Hypothesis VI. Acculturation and Health.

Hypothesis VIa: That there is a negative association between the degree of acculturation and health.

Hypothesis VIb: That the degree of acculturation is associated with health in a curvilinear relationship (a U-shaped curve).

Hypothesis VIc: That health is positively associated with congruence between the individual's degree of acculturation and the general levels of economic development and acculturation in his community.

Hypothesis VId: That health is positively associated with congruence between the degree of acculturation and the level of education.

Hypothesis VIe: That health is positively associated with congruence between the degree of acculturation and the amount of wage employment.

Acculturation is the process in which people gradually come to adopt the ways of life, and the goals, values, beliefs and feelings, of a culture different from the one into which they were born. Some N.W.T. natives have barely been affected by the white culture which has been steadily moving north; they live, think and feel much as their ancestors did. Others have been greatly influenced, to the point where they are fully integrated into the white way of life. Most natives, however, are at neither of these extremes; they and their lives have been shaped by both cultures, though the impact of whites has been greater in some communities, and for some individuals, than for others.

Acculturation is potentially as broad a concept as culture. Indicators of adoption of the white culture therefore could include a diversity of characteristics, from speaking English to worshipping a Christian God to holding individualistic, materialistic values to preferring coke and potato chips over muktuk. For the purposes of this study the best available indicators of acculturation are the responses to four questions the mothers were asked in the P.I.M.M. nutrition and sociological interviews: (1) the source of the family food, traditional native game or groceries purchased from the store; (2) the extent to which the father hunts, fishes or traps; (3) the extent to which the mother sews clothing or makes household implements in traditional native ways; and (4) whether or not the mother continues to carry her infant inside her parka or on her back according to traditional custom. These items are superior to others which might have been chosen from the P.I.M.M. study because they

best differentiate natives from whites. As Table V-5 indicates, few whites depend for food on native game, hunt, fish or trap, are involved in traditional handcrafts or carry their children inside the parka or on the back. Yet most Inuit and Dene still do, to some extent at least. The natives who don't, who live like the whites, are presumably the most acculturated. It is assumed that other aspects or dimensions of acculturation, the more psychological ones such as holding whites' goals and values, identifying with whites, and so on, are correlated with these indicators of lifestyle.

The four measures of acculturation are combined into a single index by summing the responses.[2] The range of the index is from zero in the case of a family which lives very much in the traditional way--depending mainly on the meat derived from year-round hunting and fishing, with the mother fashioning clothing and utensils from animal skins and bones, carrying her child even past infancy inside her homemade parka (amauti)--to a possible score of eight, for the family which no longer hunts, buys all its food and clothing from the store and, in the white manner, dresses the infant in his own outdoor clothing.

The four components of the index are strongly inter-correlated for the Dene families. The six *gammas* summarizing the three-by-three bivariate tables range from +.52 to +.81. They are less highly inter-correlated for the Inuit. One of the *gammas*, summarizing the relationship between the family's food source and the carrying of the child inside the parka, is only +.08 which is not statistically significant. The other *gammas*, though significant, are low, ranging between +.22 and +.47. Inuit are less consistent, therefore, in the degree to which they have adopted white ways of

TABLE V - 5

Frequency distributions for items of acculturation scale[a] for the four ethnic groups[b]

	Inuit		Dene		Mixed		White	
	%	(N)	%	(N)	%	(N)	%	(N)
Item 1: Main source of the family food								
0 mainly native game	16.7	(70)	1.4	(3)	1.2	(1)	0.7	(2)
1 one-half native game; one-half purchased from the store	62.7	(262)	58.7	(122)	29.8	(25)	4.9	(14)
2 mainly purchased from the store	20.6	(86)	39.9	(83)	69.0	(58)	94.4	(269)
Item 2: Father's participation in hunting, fishing,and trapping								
0 year round	28.3	(106)	17.0	(30)	3.7	(3)	1.6	(5)
1 part of the year	56.5	(212)	48.3	(85)	26.8	(22)	6.3	(20)
2 not at all	15.2	(57)	34.7	(61)	69.5	(57)	92.1	(290)
Item 3: Mother's participation in traditional native handcrafts								
0 much	35.1	(141)	22.4	(47)	3.7	(3)	1.9	(6)
1 a little	44.8	(180)	48.6	(102)	26.8	(22)	9.1	(29)
2 not at all	20.1	(181)	29.0	(61)	69.5	(57)	89.0	(283)
Item 4: Does the mother carry her child inside her parka or on her back?								
0 past infancy	38.1	(153)	16.8	(31)	6.2	(5)	1.9	(6)
1 in infancy only	53.2	(214)	30.8	(57)	31.3	(25)	9.1	(29)
2 not at all	8.7	(35)	52.4	(97)	62.5	(50)	89.0	(283)

(a) A family's score on the acculturation scale is computed by summing its scores on each of the four scale items.

(b) Ethnicity is that of the child. A mixed child is one with one native parent and one white parent.

life than the Dene. This may reflect the fact that they are in general less acculturated than the Dene (Table V-5) or perhaps signifies that the acculturation process, for the Inuit more than the Dene, involves the voluntary or involuntary selection of some white customs and the rejection of others.

The mean score attained by Inuit families on this scale was 3.44 out of 8; for Dene it was 5.0. Twelve Inuit families (3%) received a score of zero while none of the Dene families did. Thirty-five Dene families (17%) received the maximum score of 8 compared to five (1%) Inuit families. The distribution of scale scores was approximately normal for the Inuit, with a single mode between 3 and 4 (22.1% and 22.3% of families respectively). For the Dene the distribution was bimodal: 26.2% of the families received a score of 4, 17% received a score of 8. It is to be expected that the Inuit appear less acculturated than the Dene. Their contact with whites has generally been more recent and less extensive than the contact between Dene and whites.

Does a high level of acculturation indeed have harmful consequences for native health, as suggested in Hypothesis VIa? The linear relationships between acculturation and health are shown in Tables V-6 and V-7. The six measures of health are regressed on acculturation alone (column 1), acculturation controlling for breast-feeding practices[3] (column 2), acculturation controlling for breast-feeding and community economic development (column 3), community economic development alone (column 4), and economic development controlling for acculturation and breast-feeding (column 5).

Dene. Acculturation has a positive zero-order effect on Dene infant health (Table V-6), with three of the four slope coefficients in column 1 achieving

TABLE V - 6

Unstandardized and standardized regression coefficients, Dene health regressed on acculturation, breast-feeding practices and community economic development[(a)]

N = 203 to 230[(b)]	Acculturation score	Acculturation score, controlling for breast-feeding[(c)]	Acculturation score, controlling for breast-feeding and economic development (composite index)	Economic development (composite index)	Economic development controlling for acculturation and breast-feeding
Infant health (composite index)	0.54* (.19)	0.59* (.21)	0.03 (.01)	0.49* (.31)	0.50* (.32)
Number of illness episodes	-0.68* (-.28)	-0.74* (-.31)	-0.32 (-.13)	-0.46* (-.35)	-0.37* (-.28)
Number of inpatient days	-2.47* (-.27)	-2.85* (-.31)	-2.55* (-.28)	-0.99* (-.20)	-0.27 (-.05)
Mean severity of illness episodes	-0.08 (-.10)	-0.09 (-.10)	0.02 (.02)	-0.09* (-.18)	-0.10* (-.20)
Use of preventive health services	0.58* (.20)		0.91* (.32)	0.02 (.01)	-0.30* (-.19)
Alcohol use	0.05 (.06)		0.17* (.20)	-0.05 (-.10)	-0.11* (-.23)

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

(c) The variable breast-feeding is a dummy variable with three possible values: breast-feeding for a period greater than one month, breast-feeding for less than one month and no breastfeeding at all.

* The regression coefficient is statistically significant, alpha = .05, two-tailed test.

statistical significance. However only one of them, for the number of inpatient days, remains significant when economic development is controlled, indicating that much of the bivariate relationship between infant health and acculturation is spurious. When utilization bias is considered, the true relationship between acculturation and the composite index of infant health is probably negative, but very weak. Children from acculturated families do spend less time in the hospital, however, than children from less acculturated families.

Acculturation has positive effects on two kinds of behavior natives have learned from whites, drinking and using preventive health services (Table V-6). Note that the bivariate relationship between acculturation and alcohol is small; when economic development is controlled, acculturation is shown to have a statistically significant effect on alcohol use. In addition the small negative zero-order effect of economic development on alcohol use is transformed into a larger, statistically significant effect, when acculturation is controlled. Economic development is thus shown to have at least two different effects on alcohol use: a positive indirect effect via acculturation and a fairly substantial negative direct effect.

Inuit. The picture is somewhat different for the Inuit, as shown in Table V-7. The zero-order effect of acculturation on infant health is negative. Three of the four slopes are statistically significant. A substantial part of the effect, however, appears to be due to the benefits of breast-feeding. When this variable is controlled, all three slopes drop substantially; two of them are no longer statistically significant. The direct effect of acculturation on infant health, after community economic development is controlled, remains negative but very weak. In this respect

TABLE V - 7

Unstandardized and standardized regression coefficients, Inuit health regressed on acculturation, breast-feeding, practices and community economic development[a]

N = 393 to 441[b]	Acculturation score	Acculturation score, controlling for breast-feeding[c]	Acculturation score, controlling for breast-feeding and economic development (composite index)	Economic development (composite index)	Economic development controlling for acculturation and breast-feeding
Infant health (composite index)	-0.38* (-.11)	-0.18 (-.05)	-0.27 (-.07)	0.01 (.00)	0.16 (.10)
Number of illness episodes	-0.17 (-.06)	-0.13 (-.05)	0.11 (.04)	-0.30* (-.22)	-0.29* (-.22)
Number of inpatient days	1.59* (.15)	0.94 (.09)	1.05 (.10)	0.29 (.06)	-0.20 (-.04)
Mean severity of illness episodes	0.20* (.18)	0.13* (.12)	0.11* (.11)	0.08* (.16)	0.03 (.07)
Use of preventive health services	-0.63* (-.14)		-0.04 (-.01)	-0.87* (-.42)	-0.87* (-.42)
Alcohol use	0.25* (.23)		0.18* (.17)	0.12* (.24)	0.10* (.19)

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

(c) The variable breast-feeding is a dummy variable with three possible values: breast-feeding for a period greater than one month, breast-feeding less than one month, and no breast-feeding at all.

* The regression coefficient is statistically significant, alpha = .05, two-tailed test.

the results for the Inuit and the Dene are the same.

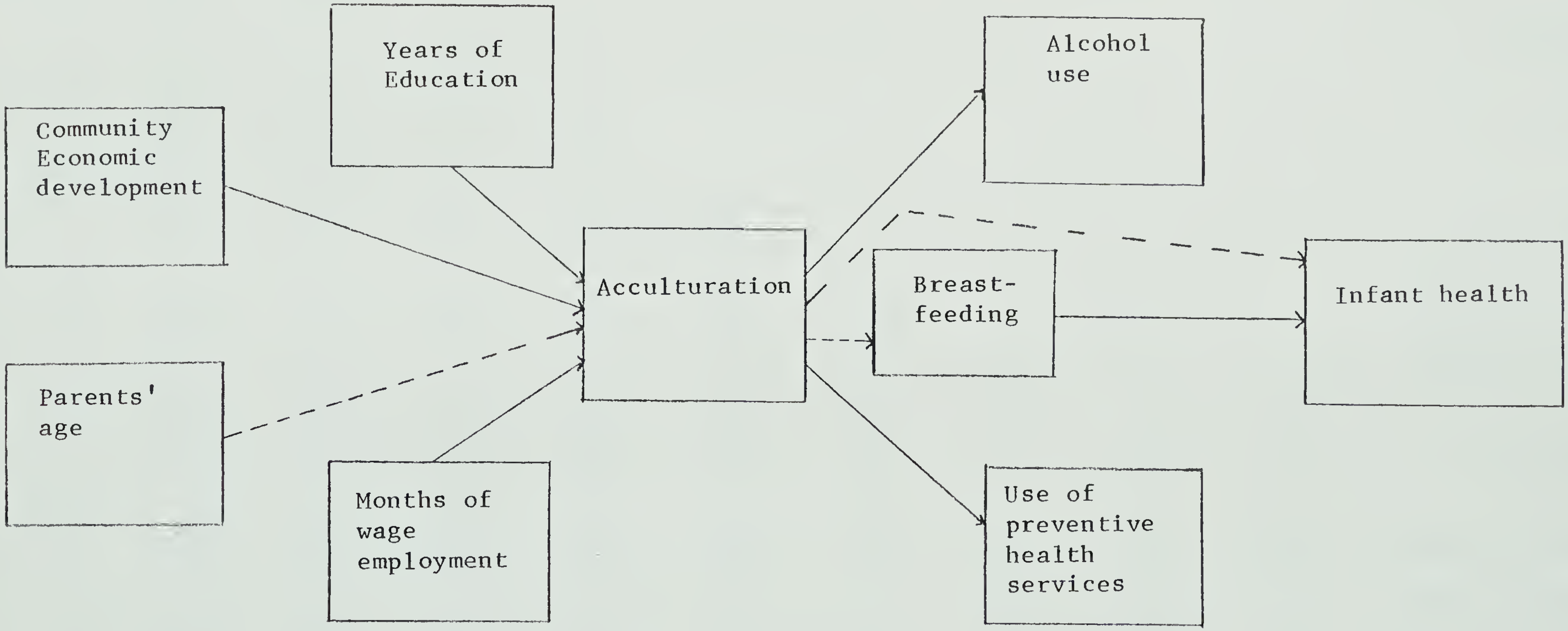
The statistically significant negative effect of acculturation on the use of preventive health services turns out to be spurious: when community economic development is controlled the slope drops to zero. A portion of the positive effect of acculturation on alcohol use is also spurious, though a statistically significant partial slope remains when community economic development is controlled. It should be noted that, in contrast to the situation with the Dene, controlling acculturation leaves a statistically significant positive direct effect of economic development on alcohol use. Development leads to alcohol use because of its acculturative effect on Inuit and also for other reasons.

At this point it is useful to insert acculturation into the path model discussed above on page 124. It is likely to be causally dependent on all four independent variables in that model--economic development, parents' age, wage employment and education. Hence its inclusion may alter the estimates of the effects of those variables on native health.

The hypothesized paths are sketched in Figure V-1. Two dummy variables, expressing mothers' breast-feeding practices with their infants, are included as general controls to remove any of the purely physiological beneficial effects of breast-feeding. The unstandardized regression coefficients and the path coefficients are displayed in Tables V-8 and V-9. Correlation coefficients are shown in Tables V-10 and V-11.

Dene. When inserted into the path analysis (Table V-8), acculturation has a small negative direct effect on the composite index of infant health, part or all of which might be due to utilization bias. Acculturation does have statistically significant beneficial effects, however, for both the number of illness episodes and the number of inpatient days. In both cases,

Figure V-1. Insertion of Acculturation and Breast-feeding into the Path Model (showing hypothesized paths)


Community Economic development
Parents' age
Years of Education
Months of wage employment
Acculturation
Alcohol use
Breast-feeding
Use of preventive health services
Infant health

Key: Solid lines represent hypothesized positive effects.
Broken lines represent hypothesized negative effects.

Note: All hypothesized paths shown in Figure IV-1 but omitted here do remain in the model.

TABLE V - 8

Regression equations, with unstandardized and standardized regression coefficients$^{(a)}$

Dene	Independent variables										
Dependent variables N = 157 to 243$^{(b)}$	Breast-feeding (dummy)	Bottle-feeding (dummy)	Use of preventive health services	Alcohol use	Acculturation	Months of wage employment	Years of education	Parents' age	Economic development (composite index)	Constant	R^2
Infant health (composite index)	1.64 (.12)	0.05 (.00)	0.08 (.08)	-0.59* (-.18)	-0.13 (-.04)	0.18 (.17)	-0.13 (-.09)	0.02 (.03)	0.47* (.30)	95.58	.168
Number of illness episodes	3.60* (-.32)	-1.51 (-.15)	0.19* (.23)	0.26 (.09)	-0.50* (-.21)	-0.01 (-.01)	-0.09 (-.08)	0.02 (.03)	-0.24 (-.19)	8.53	.265
Number of inpatient days	-7.92 (-.18)	1.11 (.03)	-0.73* (-.23)	0.92 (.09)	-2.04* (-.22)	0.09 (.03)	-0.29 (-.06)	-0.01 (-.01)	-0.29 (-.06)	26.83	.173
Mean severity of illness episodes	0.24 (.06)	0.30 (.08)	-0.06* (-.20)	0.18* (.17)	0.09 (.10)	-0.05 (-.17)	0.07 (.15)	0.00 (.00)	-0.10* (-.22)	1.27	.124
Use of preventive health services				0.34 (.10)	0.66* (.23)	0.04 (.04)	0.38* (.27)	0.11 (.15)	-0.36* (-.23)	-1.78	.112
Alcohol use					0.24* (.28)	-0.05 (-.17)	-0.01 (-.03)	0.00 (.00)	-0.09 (-.18)	4.02	.057
Acculturation						0.12* (.33)	0.05 (.11)	0.03 (.13)	0.25* (.45)	3.09	.494
Months of wage employment							0.43* (.31)	0.01 (.01)	0.51* (.33)	3.05	.292
Years of education								-0.24* (-.48)	0.40* (.36)	13.62	.438

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

inserting acculturation and breast-feeding into the equations causes the partial slopes for community economic development to drop substantially. Acculturation appears to be one of the reasons why illness episodes and inpatient days are fewer in number in the more highly developed communities. Its direct effect on Dene infant health is thus, in sum, beneficial; Hypothesis VIa appears not to be correct.

Acculturation continues to show a positive direct effect on the use of preventive care. Its insertion in the path analysis brings the negative direct effect of economic development up to statistical significance and reduces slightly the positive direct effects of age, education, wage employment and alcohol use. It should be noted that, contrary to what one might expect, education retains most of its positive direct effect on the use of preventive health services when acculturation is controlled. In addition, much of the inexplicable small positive direct effect of alcohol use on the use of preventive care remains even after acculturation is controlled.

Acculturation has an even stronger positive direct effect on alcohol use when it is inserted into the path model. The negative direct effects of both economic development and wage employment are stronger when acculturation is in the model than they are when it is omitted.

Inuit. Acculturation continues to show very small negative direct effects on infant health when inserted into the path model (Table V-9). Breast-feeding, however, does have statistically significant beneficial effects for three measures of infant health--the composite index, the number of inpatient days and the mean severity of illness episodes. Breast-fed babies are healthier than bottle-fed babies. Insertion of acculturation and breast-

TABLE V - 9

Regression equations, with unstandardized and standardized regression coefficients[(a)]

Inuit	Independent variables										
Dependent variables N = 347 to 446[(b)]	Breast-feeding (dummy)	Bottle-feeding (dummy)	Use of pre-ventive health services	Alcohol use	Accul-turation	Months of wage employ-ment	Years of edu-cation	Parents' age	Economic develop-ment (compos-ite index)	Con-stant	R^2
Infant health (composite index)	1.06 (.09)	-2.01* (-.17)	0.05 (.07)	-0.13 (-.04)	-0.30 (-.08)	0.03 (.03)	0.06 (.04)	0.03 (.04)	0.21* (.12)	91.79	.082
Number of illness episodes	-1.35 (-.14)	-1.11 (-.11)	0.15* (.23)	-0.36* (-.14)	0.15 (.05)	-0.04 (-.04)	0.02 (.01)	0.04 (.06)	-0.14 (-.08)	7.84	.126
Number of inpatient days	-6.40* (-.18)	1.90 (.05)	-0.41* (-.17)	0.76 (.08)	0.56 (.05)	0.13 (.04)	0.48 (.10)	0.11 (.05)	-0.63* (-.13)	9.42	.112
Mean severity of illness episodes	-0.03 (-.01)	0.86* (.23)	-0.03* (-.13)	0.09 (.09)	0.09 (.08)	0.02 (.05)	-0.06 (-.11)	-0.03* (-.14)	0.00 (.00)	3.12	.152
Use of preventive health services				-0.37 (-.09)	-0.11 (-.02)	-0.02 (-.01)	0.50* (.24)	0.18* (.19)	-0.84* (-.41)	12.09	.221
Alcohol use					0.16* (.14)	0.00 (.00)	0.06 (.11)	0.01 (.04)	0.10* (.19)	2.88	.092
Acculturation						0.09* (.29)	0.11* (.24)	0.00 (.01)	0.10* (.19)	2.58	.100
Months of wage employment							0.20* (.13)	-0.10* (-.14)	0.24* (.16)	8.03	.093
Years of education								-0.26* (-.58)	0.09* (.09)	11.20	.354

(a) Standardized regression coefficients are in brackets.

(b) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Regression coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE V - 10

Correlation matrix: Dene acculturation and breast-feeding practices with health, wage employment, education, age and economic development (continued from Table IV - 15)

N = 157 to 210[(a)]	Breast-feeding (dummy)	Bottle-feeding (dummy)	Acculturation
Infant health (composite index)	.07 (204)	-.04 (204)	.19* (210)
Number of illness episodes	-.17* (204)	.01 (204)	-.28* (210)
Number of inpatient days	-.15* (204)	.14* (204)	-.26* (210)
Mean severity of illness episodes	.02 (204)	.02 (204)	-.10 (210)
Use of preventive health services	-.10 (204)	-.04 (204)	.20* (210)
Alcohol use	-.11 (185)	.06 (185)	.06 (203)
Months of wage employment	-.18* (157)	.23* (157)	.56 (168)
Years of education	-.10 (190)	.14 (190)	.39 (208)
Parents' age	-.06 (204)	.00 (204)	-.10 (210)
Economic development (composite index)	-.13 (192)	.16* (192)	.63* (198)
Acculturation	-.18* (190)	.20* (190)	

(a) Correlation matrix was constructed by the pair-wise deletion of missing values. N for each correlation is in brackets.

* Correlation coefficient is statistically significant, alpha = .05, two-tailed test.

TABLE V - 11

Correlation matrix: Inuit acculturation and breast-feeding practices with health, wage employment, education, age and economic development (continued from Table IV - 16

N = 347 to 415(a)	Breast-feeding (dummy)	Bottle-feeding (dummy)	Acculturation
Infant health (composite index)	.23* (415)	-.24* (415)	-.11* (403)
Number of illness episodes	.05 (415)	-.09 (415)	-.06 (403)
Number of inpatient days	-.26* (415)	.22* (415)	.15* (403)
Mean severity of illness episodes	-.26* (415)	.30* (415)	.18* (403)
Use of Preventive health services	.28* (415)	-.22* (415)	-.14* (403)
Alcohol use	-.15* (377)	.10 (377)	.23* (391)
Months of wage employment	-.02 (347)	.04 (347)	.39* (363)
Years of education	-.02 (374)	-.03 (374)	.35* (390)
Parent's age	.03 (414)	.02 (414)	-.24* (402)
Economic development (composite index)	-.27* (414)	.23* (414)	.32* (400)
Acculturation	-.26* (386)	.21* (386)	

(a) Correlation matrix was computed by the pair-wise deletion of missing values. N for each correlation is in brackets.

* Correlation coefficient is statistically significant, alpha = .05, two-tailed test.

feeding into the model raises the positive direct effect of economic development on the composite index and the number of inpatient days to statistical significance and drops the negative direct effect of development on the mean severity of illness episodes to zero. Thus development appears to be slightly beneficial for Inuit infant health when the ill effects of bottle-feeding are removed.

Acculturation appears to have no direct effect on the use of preventive care when the other variables are controlled; age, education and the level of community economic development continue to be the important determinants of this variable. Acculturation does have a small positive effect on alcohol use which, as one would expect, reduces slightly the positive effects of wage employment, education and community economic development.

To summarize: acculturation is slightly beneficial for Dene, slightly detrimental for Inuit. For the Dene, acculturation leads to better use of preventive health services, fewer illness episodes and fewer hospital days for infants, though there is very little effect on the composite index of infant health. For the Inuit, in contrast, acculturation has no effect on the use of preventive care and small adverse effects on all four indicators of infant health. Bottle-feeding, a consequence of acculturation, has a clearly negative effect on Inuit infant health. In both groups acculturation leads to increased alcohol use. Thus there is a small smount of evidence in favour of Hypothesis VIa for the Inuit but not for the Dene.

Might the surprisingly small effects of acculturation be due to the existence of a curvilinear relationship with native health? Might it be

the case, as suggested in Hypothesis VIb, that psychological stresses and their consequences are greatest among moderately acculturated native people, those with a foot in each culture, while the least and the most acculturated are comparatively healthy? The test of this hypothesis is displayed in Table V-12.

To test for a curvilinear relationship between acculturation and health, each measure of health was regressed first on community economic development and acculturation. The percentage of explained variance obtained is shown in Table V-12. Then the square of the acculturation term was added to the equation and the additional explained variance was computed. If Hypothesis VIb is correct, the squared terms should be positive in sign, signifying a U-shaped curve, for the composite index of infant health and for the use of preventive health services. They should be negative for the other four measures of health.

Dene. For the Dene, the amount of curvilinearity is small, though it is mostly in the hypothesized directions. All four of the squared terms for the measures of infant health have the expected signs though only one of them, for the number of illness episodes, achieves statistical significance. Part of this curvilinear effect is due to utilization bias, as evidenced by the unexpected inverted U-shaped relationship between acculturation and the use of preventive health services. The statistically significant curvilinearity between acculturation and both alcohol use and the use of preventive care, combined with the larger positive linear effects contained in the path analysis, shows that both alcohol use and the use of preventive services are low among the least acculturated Dene, but rise and then plateau as acculturation increases. There is thus some evidence, though it

TABLE V - 12

Curvilinearity, Dene and Inuit health with acculturation

	Dene	(N = 198)(a)	Inuit	(N = 400)(a)
	% of variance explained by: economic development (composite index) and acculturation	additional % of variance explained by the square of the acculturation term	% of variance explained by: economic development (composite index) and acculturation	additional % of variance explained by the square of the acculturation term
Infant health (composite index)	9.45	1.12 (+)	1.29	.03 (-)
Number of illness episodes	12.98	1.78*(-)	5.00	.95*(-)
Number of inpatient days	7.20	.11 (-)	1.89	.00
Mean severity of illness episodes	3.17	.02 (-)	1.94	.46 (+)
Use of preventive health services	6.29	2.47*(-)	17.84	.40 (-)
Alcohol use(a)	3.53	2.76*(-)	8.45	.12 (+)

(a) For the variable alcohol use, N = 193 Dene and 391 Inuit.

* The addition to R^2 is statistically significant, alpha = .05.

is very slim, in support of Hypothesis VIb.

Inuit. For the Inuit the only evidence supporting Hypothesis VIb is one meagre statistically significant squared term, for the number of illness episodes, which explains less than one percent of the variance (Table V-11). None of the other squared terms has any explanatory power.

Hypotheses VIc, VId, and VIe concern the possibility that acculturation, in combination with other variables in the model, exerts interactive effects on native health. Hypothesis VIc suggests that native health is best when there is a congruence between individual acculturation and community development and acculturation. That is, acculturation will be less beneficial for natives living in isolated settlements with low levels of economic development, where the general population is not very acculturated, than for natives in the large towns. In fact in the large towns, where natives are generally more acculturated, a high level of acculturation may be necessary if an individual is to adapt successfully.

Two interaction terms were constructed to test this hypothesis. The congruence between acculturation and community economic development is represented by the product of the deviations from the mean of both variables, acculturation and development. Thus families receiving high scores on this product term are either highly acculturated natives living in the large developed town or natives with low acculturation scores living in the least developed communities.

The second interaction term includes the family acculturation scale and a general measure of the acculturation level in the community, an index of the languages--native and/or English--spoken by the natives of the community. Data on native language use in each N.W.T. community were

taken from the Manpower Survey of 1968-69 conducted by the Department of Indian Affairs and Northern Development. In the survey, which succeeded in interviewing approximately 90% of the native adults in the N.W.T., each person was asked which languages he spoke. Some spoke their native language only, some spoke English as well, and some spoke only English. For the purposes of this study, an index of community language use was constructed according to the formula:

$$CL = (0(L_N) + 1(L_{NE}) + 2(L_E))/(L_N + L_{NE} + L_E)$$

where CL is the index of community language use, L_N is the number of native adults who speak their native language only, L_{NE} is the number of native adults who speak English as well as a native language, and L_E is the number of native adults who speak English only. The index has a possible range from zero, in the case of community in which none of the native inhabitants knows English, to 2.0 for a community in which the native language has disappeared. The actual range was from 0.22 for Clyde River, an Inuit settlement on the East coast of Baffin Island, to 1.55 for Inuvik. In general the Dene communities had considerably higher scores on this index than the Inuit communities. Since language is a central component of any culture, this index is a useful measure of the general levels of acculturation in the N.W.T. communities.

After the index was obtained, it was inserted into the interaction term representing the congruence between a family's level of acculturation and the general level of community acculturation (the product of the deviations from the mean for both variables.) Receiving high scores on this interaction term were highly acculturated families living in predominantly English-speaking communities and families with low acculturation

scores living in communities where a native language was spoken most of the time.

The product terms were added to regression equations which already contained the component variables (as well as the two dummy variables representing breast-feeding) and the resulting improvement in explained variance was recorded. The results are shown in Tables V-13 and V-14.

Dene. For the Dene (Table V-13), both product terms contribute a statistically significant improvement with regard to the composite index of infant health. Congruence is, as hypothesized, beneficial. Moreover, congruence between family acculturation and general community acculturation, represented by the index of native language use, is significantly related to alcohol use, again in the hypothesized direction. A surprising finding is a very strong negative relationship between family and community acculturation congruence and the use of preventive health services. The most conscientious users of health services tend in the isolated settlements to be the more acculturated natives and in the large towns the less acculturated natives. Precisely the opposite was hypothesized. This finding indicates that part of the observed relationship between family and community acculturation congruence and the composite index of infant health is due to utilization bias. Thus there is contradictory evidence for Hypothesis VIc: congruence is rather weakly associated with low alcohol use and improved infant health but more strongly associated with a tendency to neglect preventive health care.

Inuit. For the Inuit (Table V-14), there is little evidence in favour of or against the hypothesis. Only one of the twelve tests resulted in statistical significance: there appears to be a very weak positive associ-

TABLE V - 13

Interaction effects: acculturation, community economic development, community languages and Dene health

	Additional % of variance explained by the interaction term: acculturation X economic development (composite index)[a] N = 198 to 230[c]	Additional % of variance explained by the interaction term: acculturation X community languages[b] N = 168 to 230[c]
Infant health (composite health)	2.79*(+)	2.35*(+)
Number of illness episodes	.32 (-)	.10 (-)
Number of inpatient days	.02 (-)	.07 (+)
Mean severity of illness episodes	1.76 (-)	1.12 (-)
Use of preventive health services	.88 (-)	8.45*(-)
Alcohol use	.66 (-)	2.75*(-)

(a) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy).

(b) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy) and community languages.

(c) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Addition to R^2 is statistically significant, alpha = .05.

TABLE V - 14

Interaction effects: acculturation, community economic development, community languages and Inuit health

	Additional % of variance explained by the interaction term: acculturation X economic development (composite index)[a] N = 400 to 441[c]	Additional % of variance explained by the interaction term: acculturation X community languages[b] N = 360 to 441[c]
Infant health (composite index)	1.19*(+)	.07 (+)
Number of illness episodes	.01 (-)	.17 (+)
Number of inpatient days	.03 (-)	.03 (+)
Mean severity of illness episodes	.28 (-)	.02 (-)
Use of preventive health services	.27 (-)	.62 (-)
Alcohol use	.02 (-)	.10 (-)

(a) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy).

(b) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy) and community languages.

(c) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Addition to R^2 is statistically significant, alpha = .05.

ation between the composite index of infant health and congruence between family acculturation and community economic development.

Hypotheses VId and VIe suggest two additional types of interaction which might influence native health: acculturation may be beneficial for natives with enough education to prepare them for a white way of life but harmful for uneducated natives; acculturation may be beneficial for natives with wage employment and hence a high enough income to purchase a white way of life but harmful for natives without jobs. Therefore two additional congruence terms were constructed, again by computing the products of deviations from the mean.

Dene. For the Dene (Table V-15) the data support both hypotheses, at least with regard to infant health and alcohol use. Infant health, particularly the composite index and the mean severity of illness episodes, is good and alcohol use low among the natives whose levels of education, wage employment and acculturation are congruent. Especially to be noted is the relatively large amount of variance in alcohol use explained by acculturation-education congruence. The linear path model, which explains precisely the same proportion of the variance in alcohol use as does this single interaction term, is shown to be inadequate.

Inuit. Hypotheses VId and VIe appear (Table V-16) to be unsupported for the Inuit. The interaction terms explain virtually none of the variance in any of the measures of native health.

To summarize the relationship between acculturation and health: for Dene acculturation is, over all, slightly beneficial; it is not harmful, as suggested in Hypothesis VIa. Only in terms of alcohol use, a practice introduced by whites and hence itself an indicator of acculturation, does

TABLE V - 15

Interaction effects: acculturation, education, wage employment and Dene health

	Additional % of variance explained by the interaction term: acculturation X education[a] N = 190 to 230[c]	Additional % of variance explained by the interaction term: acculturation X wage employment[b] N = 157 to 230[c]
Infant health (composite index)	3.70*(+)	2.89*(+)
Number of illness episodes	1.40 (-)	.05 (-)
Number of inpatient days	.06 (-)	.02 (-)
Mean severity of illness episodes	2.34*(-)	4.33*(-)
Use of preventive health services	.65 (-)	1.04 (-)
Alcohol use	5.69*(-)	1.65 (-)

(a) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy), education.

(b) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy), wage employment.

(c) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Addition to R^2 is statistically significant, alpha = .05.

TABLE V - 16

Interaction effects: acculturation, education, wage employment and Inuit health

	Additional % of variance explained by the interaction term: acculturation X education[a] N = 374 to 403[c]	Additional % of variance explained by the interaction term: acculturation X wage employment[b] N = 347 to 403[c]
Infant health (composite index)	.02 (-)	.05 (-)
Number of illness episodes	.00	.00
Number of inpatient days	.01 (-)	.00
Mean severity of illness episodes	.02 (+)	.05 (+)
Use of preventive health services	.48 (-)	.18 (+)
Alcohol use	.36 (-)	.01 (-)

(a) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy), education.

(b) Additional % of variance explained after the following terms have previously been put in the regression equation: economic development (composite index), acculturation, breast-feeding (dummy), bottle-feeding (dummy), wage employment.

(c) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

* Addition to R^2 is statistically significant, alpha = .05.

acculturation have harmful effects. Evidence for curvilinearity (Hypothesis VIb) is also very slight: alcohol use plateaus rather than continues to climb as acculturation increases. There is a slight tendency (Hypothesis VIc) for acculturation to be most beneficial in economically developed communities where the Dene population is in general highly acculturated. Acculturation is also most beneficial (Hypothesis VId and VIe) for Dene who are well educated and employed. In fact, acculturation is detrimental for the uneducated and the unemployed. This finding, the strongest involving the effects of acculturation, suggests a relative deprivation explanation. Acculturated Dene have given up the native way of life in order to live like the whites. But this goal is impossible to achieve without the education, the job, the income that is required to maintain a white lifestyle. As a result they have become frustrated and depressed, have turned to alcohol and have begun to neglect their own and their children's health. This possible explanation is examined in detail below.

For the Inuit, acculturation appears to be slightly detrimental, though the greatest danger to infant health seems to come from the physiological consequences of switching from breast-feeding to bottle-feeding. Alcohol use is higher among the most acculturated Inuit. Use of preventive care is, somewhat surprisingly, unrelated to acculturation. There are no curvilinearity nor any interaction effects observed.

Hypothesis VII. Relative Deprivation and Health.

Hypothesis VIIa: That health is positively associated with congruence between level of education and amount of wage employment.

Hypothesis VIIb: That health is positively associated with congruence between the individual's amount of wage employment and the rate of native wage employment in his community.

Hypothesis VIIc: That health is positively associated with congruence between the individual's amount of wage employment and the level of economic development in his community.

There is already some evidence in favour of the relative deprivation theory: Inuit infant health is poor, alcohol use high, in communities which experienced negative growth between 1960 and 1970. Is development therefore damaging when it is of short duration, when it provides jobs and high incomes, establishes appetites and expectations for a high standard of living--only to have them dashed when the development project ends? Among the Dene, a high level of acculturation is beneficial, in terms of health, for those natives with jobs, but harmful for natives without jobs. It is healthier, if you are a native without a job, to be living in the traditional Dene manner. Is this because the acculturated Dene aspire to the standard of living of the whites they are emulating--but can't have it because there is no wage employment? Is economic development therefore detrimental to native health because it raises hopes--the revolution of rising expectations--without, for many native people, fulfilling them?

The three relative deprivation hypotheses are tested by constructing three additional interaction terms and adding them to regression equations containing their components. The first interaction term is the product of the deviations from the mean of education and wage employment. The sign is reversed, however, so that the term reflects inconsistency or lack of congruence between the terms: a native with a high education but low wage employment (and vice versa) receives a high score, representing high relative deprivation. Natives who receive low relative deprivation scores are those with good educations who have jobs and those without education who

don't. The second interaction term, the product of the deviations from the mean of wage employment and economic development, is constructed in a similar fashion. Natives receive a high relative deprivation score if they live in economically advanced communities, where many residents earn high incomes, but are themselves unemployed. They receive low scores if they have jobs in those developed communities or if they are without a job in an isolated settlement where few residents are employed.

The third interaction term is the product of the deviations from the mean for wage employment and the community native wage employment rate. This rate, the percentage of native male adults in the community who worked for wages twenty-four weeks or more in the previous year, is computed from the data of the D.I.A.N.D. Manpower survey. Unlike the composite index of community economic development, which is based on data for both whites and natives, it measures the amount of employment available to natives alone. If feelings of deprivation occur when an native person compares himself with other natives who are better off than him, then he is most susceptible if he lives in a community where many natives are employed. If few natives have jobs, then he will not feel so deprived.

Tables V-17 and V-18 show the additional percentage of variance in the health measures which is explained by adding these interaction terms to the regression equations. The first three columns report the results when each term is added separately; the fourth column represents the additional explained variance when all three interaction terms are added to an equation already containing the components of each term.

Dene. Relative deprivation and Dene health are clearly related (Table V-17). Seventeen of the eighteen signs are in the hypothesized directions; inter-

TABLE V - 17

Relative deprivation and Dene health.
Interaction effects of wage employment, education, community economic development and the community native wage employment rate on Dene health

	Interaction terms representing relative deprivation(b)			
N = 157 to 230(a)	Additional % of variance explained: wage employment X education(c)	Additional % of variance explained: wage employment X economic development (composite index)(c)	Additional % of variance explained: wage employment X community native wage employment rate(c)	Additional % of variance explained: all three interaction terms(d)
Infant health (composite index)	9.49*(-)	1.14 (-)	1.89 (-)	7.79*
Number of illness episodes	6.73*(+)	2.25*(+)	5.05*(+)	7.83*
Number of inpatient days	4.33*(+)	0.23 (+)	0.05 (+)	4.19
Mean severity of illness episodes	3.93*(+)	0.28 (+)	0.04 (+)	3.71
Use of preventive health services	0.85 (-)	0.72 (-)	0.52 (+)	5.18
Alcohol use	2.83*(+)	0.43 (+)	4.35*(+)	7.17*

(a) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

(b) Product terms are constructed to reflect inconsistency between their components. For example, high education and low wage employment (and vice versa) produce an interaction term with a high score, representing high relative deprivation.

(c) The interaction term is added to a regression equation previously containing each component of the term.

(d) The three interaction terms are added to a regression equation containing each component of each interaction term.

* Addition to R^2 is statistically significant, alpha = .05.

action terms are statistically significant in eight of the eighteen equations; the three relative deprivation terms together explain a considerable part of the variance, over seven percent, of the composite index of infant health, the number of illness episodes and alcohol use.

But the most important source of relative deprivation appears to be incongruence between education and wage employment. This interaction term explains more than nine percent of the variance in the composite index of infant health, a remarkable occurrence when its two terms separately explain virtually none. A closer look at the interaction effect of education and wage employment on Dene health is provided in Table V-19. Both independent variables are dichotomized, creating four categories (low education and low employment, low education and high employment, high education and low employment, and high education and high employment) for which means on all the measures of health are computed. The best health, on all six measures, occurs among Dene with high education and high employment. In this group, the number of illness episodes and the number of inpatient days are both low; as a result scores on the composite index of infant health are high. It should be noted that a lack of wage employment is not detrimental among the less educated Dene; if anything health is slightly better among those without jobs. But the reverse is true for educated Dene: not having a job has serious consequences for infant health, alcohol use and, to a lesser extent, the use of preventive health services. Educated Dene without jobs have, in fact, the poorest infant health and the greatest alcohol use in the entire sample. The development process which brought them an education without wage employment has indeed been costly.

TABLE V - 18

Relative deprivation and Inuit health.
Interaction effects of wage employment, education, community economic development and the community native wage employment rate on Inuit health

N = 353 to 441(a)	Interaction terms representing relative deprivation(b)			
	Additional % of variance explained: wage employment X education(c)	Additional % of variance explained: wage employment X economic development (composite index)(c)	Additional % of variance explained: wage employment X community native wage employment rate(c)	Additional % of variance explained: all three interaction terms(d)
Infant health (composite index)	0.35 (+)	1.12*(-)	0.46 (-)	1.41
Number of illness episodes	0.04 (+)	0.04 (-)	1.00 (+)	1.09
Number of inpatient days	0.14 (+)	1.02 (+)	0.44 (+)	1.05
Mean severity of illness episodes	0.47 (-)	0.18 (+)	0.15 (-)	1.35
Use of preventive health services	0.60 (-)	0.01 (+)	1.01 (+)	0.70
Alcohol use	0.36 (+)	0.42 (+)	0.05 (-)	0.99

(a) Multiple regressions were performed upon a correlation matrix constructed by the pair-wise deletion of missing values.

(b) Product terms are constructed to reflect inconsistency between their components. For example, high education and low wage employment (and vice versa) produce an interaction term with a high score, representing high relative deprivation.

(c) The interaction term is added to a regression equation containing each component of the term.

(d) The three interaction terms are added to a regression equation containing each component of each interaction term.

* Addition to R^2 is statistically significant, alpha = .05.

TABLE V - 19

Relative deprivation and Dene health: the interaction effect of wage employment and education (dichotomized) on Dene health

	Parents' average years of education	Father's months of wage employment during the previous year 0 to 6 months	7 to 12 months
Mean infant health score (composite index)	0- to 6 years	93.88 (N = 58)	93.57 (N = 29)
	7 to 18 years	90.75 (N = 30)	96.60 (N = 51)
Mean number of illness episodes	0 to 6 years	8.8	8.8
	7 to 18 years	8.2	5.5
Mean number of inpatient days	0 to 6 years	15.1	15.3
	7 to 18 years	16.4	4.5
Mean average severity of illness episodes	0 to 6 years	2.20	2.25
	7 to 18 years	3.20	1.91
Mean use of preventive health services	0 to 6 years	9.0	8.4
	7 to 18 years	9.0	11.5
Mean alcohol use	0 to 6 years	4.95 (N = 57)	5.07 (N = 29)
	7 to 18 years	5.10 (N = 30)	4.36 (N = 47)

It should be noted that relative deprivation, though undoubtedly a consequence of the development process, is in fact more common in the less developed Dene communities. The index of community economic development has zero-order correlations of -.30, -.27 and -.11 with the three relative deprivation terms, employment-education, employment-community economic development, and employment-native wage employment rate. This means that relative deprivation is one of the intervening variables which account for the positive relationship between economic development and Dene health. Unfortunately, the part of this relationship which can be attributed to relative deprivation is quite small.[4] Other factors, still unknown, are responsible for most of the beneficial effects of development.

Inuit. It is surprising to find (Table V-18) no evidence that relative deprivation is a serious problem among the Inuit. The interaction terms fail to explain any of the variance in the measures of health. Many of the signs are not even in the hypothesized directions.

Summary.

Three major findings have emerged regarding the "costs" of development for native health: First, rapid economic and demographic growth is not generally detrimental for health, among either the Dene or the Inuit. In fact it appears that negative growth, which occurs when economic activity slows and whites leave, has been detrimental, especially for Inuit alcohol use. Second, acculturation is not generally harmful. It is even somewhat beneficial for the Dene, especially those who are educated and employed. Among the Inuit it is only the decline of breast-feeding which seems to have negative consequences. Third, relative deprivation, especially the lack of jobs among those with a high education, is a serious

contributor to poor infant health and heavy alcohol use among the Dene. It alone appears to be a "cost" of development, though it is in fact more common in the less developed communities. Among the Inuit this form of relative deprivation appears to have no effect on health.

Therefore the critics of development, including Berger and many of the witnesses who testified before him, are not supported by these data, except insofar as they object to development projects which are unable to satisfy the employment aspirations they generate. Development appears to be harmful to native health only if it is of short duration or if it provides education without jobs.

The findings of this chapter do not go very far in providing answers to the two puzzling questions which emerged from the findings of Chapter IV: why are the effects of development so different for Dene and Inuit? What aspects of development are responsible for its beneficial effect on Dene health? Only relative deprivation seems to provide a partial explanation: the two native groups differ in their response to development partly because of the effect of relative deprivation, which is strong among the Dene but non-existent among the Inuit; the low rates of relative deprivation in the developed Dene communities help explain the high rates of health there. But this answer is far from complete. Even when relative deprivation is taken into account, much of the difference between Dene and Inuit in their response to development and much of the beneficial effect of development on Dene health remains unexplained. Moreover a third puzzling question is added: why is relative deprivation damaging for the Dene but not the Inuit? These questions will be discussed at more length in Chapter VI.

Chapter VI

CONCLUSIONS

This study is an attempt to contribute to the debate about the benefits and costs of economic development for the native people of the Northwest Territories. The Canadian government believes that development is essential to improve the health and well-being of the Dene and the Inuit. Many others, including Berger, believe just the opposite, that development of the kind which has been taking place in the North is harmful for native health. It is presently an unresolved question whether the presumed benefits of development--improved health services, higher levels of education, wage employment opportunities resulting in higher standards of living--more than compensate for any social and psychological costs caused by rapid rates of social change, the process of acculturation, and the conditions of relative deprivation and political powerlessness which may be associated with economic development. Do the benefits outweigh the costs or do the costs outweigh the benefits? Since the federal government has stated that improving the welfare of northerners is a major policy goal, this question is of crucial importance for planning the future development of the North.

Summary of the Results

Patterns of native alcohol use, infant health and use of preventive health care in the N.W.T. in the early 1970's have been examined in an attempt to test various hypotheses concerning the costs and benefits of development. The hypotheses and the results of the data analysis are summarized here.

Hypothesis Ia: That natives' health is positively associated with their community's level of economic development.

Hypothesis Ib: That natives' health is negatively associated with their community's level of economic development.

Hypothesis Ic: That natives' health is associated with their community's level of economic development is a curvilinear (U-shaped curve) relationship.

These were the major hypotheses of the study. The data for the Dene support Hypothesis Ia quite strongly: infant health is positively associated with economic development and alcohol use is negatively associated with economic development, both in terms of zero-order correlations (Table IV-5) and within a path model containing seven possible intervening variables (Table V-8). For the Inuit, in contrast, the data provide more support for Hypothesis Ib. Alcohol use is higher, use of preventive care lower, in the more developed settlements (Table IV-6), relationships which persist as direct effects in the path model (Table V-9). There is little observable relationship between economic development and Inuit infant health. It is perhaps weakly negative in terms of zero-order correlations (when utilization bias is considered) and weakly positive when direct effects are estimated in the path model. There is little evidence, in either the Dene or the Inuit, for Hypothesis Ic (Table IV-7). Curvilinearity in the predicted direction was found only for Inuit alcohol use: it is low in the less developed communities, rises but then plateaus as development increases.

In short, the overall effect of development appears to be beneficial for the Dene but not for the Inuit.

Hypothesis II: That there is a positive association between the quantity of health services available in the community and health.

This hypothesis is confirmed for the Dene (Table IV-8) but not for the Inuit (Table IV-9), in terms of zero-order correlations. It was not

possible to incorporate the quantity of health services available in the community into the path model because its correlation with community economic development was too high. It is therefore impossible to determine if the observed associations reflect direct causal relationships or if they are spurious. It is likely, for several reasons discussed on page , that they are spurious.

Hypothesis III: That there is a positive association between the amount of education received and health.

This hypothesis is not confirmed, either for the Dene or for the Inuit. The level of parents' education has no zero-order association with infant health (Tables IV-10 and IV-11), nor is there a significant direct path linking these two variables in the path model (Tables V-8 and V-9). Education does lead to improved use of preventive health services in both native groups, however. The effect of education on alcohol use is very weak, among both the Dene and the Inuit.

Hypothesis IV: That there is a positive association between the amount of wage employment held and health.

There is a small amount of evidence in favour of this hypothesis for the Dene but not for the Inuit. A fairly high zero-order association between wage employment and infant health among the Dene is reduced considerably when community economic development is controlled (Table IV-14), indicating that employed Dene have healthy children partly because they tend to live in the developed communities. There is also a small negative relationship between wage employment and Dene alcohol use, especially in the path model (Table V -8). Among the Inuit, wage employment has little effect on infant health, the use of preventive care, or alcohol use (Tables IV-15, V-9).

Hypothesis Va: That there is a negative association between the rate of economic and demographic growth in the community from 1961 to 1971 and health.

Hypothesis Vb: That the association between the rate of economic and demographic growth in the community from 1961 to 1971 and health is curvilinear (an inverted U-shaped curve).

These hypotheses received little support. Among the Dene, the rate of growth in per capita income had a positive effect on health (Table V-1) as did the rate of growth in the white population (Table V-2). The only indicator of development for which rapid growth was associated with poor infant health was the rate of industrial employment, and its association was not strong (Table V-1). Tests for curvilinearity showed only a single sizable effect: Dene alcohol use is greatest in communities experiencing the fastest and the slowest population growth (Table V-2). Among the Inuit, stronger relationships were found, but they were not as hypothesized. The rate of growth has generally positive effects on health, mainly because negative growth has been harmful. Alcohol use is high, infant health is poor and the use of preventive care is low in those settlements which experienced negative growth between 1961 and 1971 (Tables V-3 and V-4).

Hypothesis VIa: That there is a negative association between the degree of acculturation and health.

Hypothesis VIb: That the degree of acculturation is associated with health in a curvilinear relationship (a U-shaped curve).

Hypothesis VIc: That health is positively associated with congruence between the individual's degree of acculturation and the general levels of economic development and acculturation in his community.

Hypothesis VId: That health is positively associated with congruence between the degree of acculturation and the level of education.

Hypothesis VIe: That health is positively associated with congruence between the degree of acculturation and the amount of wage employment.

The data fail to support Hypothesis VIa, for either Dene or Inuit, except that acculturation appears to lead to alcohol use in both groups (Tables V-8, V-9). The curvilinearity hypothesized appears only for alcohol

use among the Dene: alcohol use increases with acculturation up to a point and then plateaus. (Table V-12). There is no evidence for Hypothesis VIb among the Inuit (Table V-12). Hypotheses VIc, VId and VIe receive considerable support for the Dene (Tables V-13 and V-15) but none for the Inuit (Tables V-14 and V-16): acculturation has beneficial effects mostly among those Dene who live in developed communities where inhabitants are highly acculturated, among Dene who are well-educated and among Dene with jobs.

Hypothesis VIIa: That health is positively associated with congruence between the level of education and the amount of wage employment.

Hypothesis VIIb: That health is positively associated with congruence between the individual's amount of wage employment and the rate of native wage employment in his community.

Hypothesis VIIc: That health is positively associated with congruence between the individual's amount of wage employment and the level of economic development in his community.

The data support all three hypothesis for the Dene (Table V-17) but none of them for the Inuit (Table V-18). For all six indicators of Dene health, lack of wage employment damages health among the well-educated Dene but not among the poorly educated Dene (Table V-19). Lack of wage employment has its most serious consequences in communities with high levels of development and high rates of native wage employment. In short, there is abundant evidence of the damaging effects of relative deprivation among the Dene but none among the Inuit.

To summarize, it appears that the overall effect of economic development has been beneficial for the Dene but not for the Inuit (Hypothesis I). The availability of hospitals and doctors in the more developed communities does not seem to be a factor producing higher levels of health there, though

limitations in data analysis leave that question in doubt (Hypothesis II). Formal education appears to have a negligible effect on health, in both native groups (Hypothesis III). Wage employment has very little net impact, beneficial or detrimental, for the Dene or for the Inuit (Hypothesis IV). The rate of economic and demographic growth has no observable systematic effects, except that negative growth is associated with very high levels of alcohol use in Inuit communities (Hypothesis V). The level of acculturation has a positive, rather than the hypothesized negative effect on Dene health, particularly among those who are employed and well educated; it has no observable effect among the Inuit (Hypothesis VI). Relative deprivation, especially that which results from a shortage of wage employment opportunities among the well-educated, is detrimental for health, though only among the Dene (Hypothesis VII).

Limitations of the Data

These findings must be interpreted with some caution, due to limitations of the data. Three sorts of limitations, discussed more fully in various locations above, should be kept in mind.

First, sensitive indicators of a number of important variables were not available. Thus it was not possible to examine the effects of native powerlessness (actual or perceived), community occupational segregation by race, discrimination, community disorganization, and other factors on native health. Lacking useful measures of family income, acculturation (the more psychological aspects), adult psychological health and so on, the study had to make do with the limited measures available. The result is a less than complete picture of the native experience of the economic development process.

This is the most serious limitation. One consequence of it, for

example, is that the reasons for the positive association between community economic development and infant health among the Dene remain unknown. The positive zero-order correlation persists as a strong direct effect even after all hypothesized intervening variables have been taken into account. In addition, the exclusion of important causal factors may have produced distortions in the estimates of relationships among the variables which were measured (i.e., the possibility of correlated disturbance terms).

Second, some of the measures which were available contain large components of error. Ratings of alcohol use are perhaps the least reliable but the census data, the interview data and even the data generated by routine record-keeping in the health facilities are all subject to error, exaggerated perhaps by the isolated locale of the study and its focus on native people. The general consequence of this sort of error is to reduce the observed associations among variables (and hence explained variances) but there may also have been systematic error which distorted estimates of relationships in other ways.

Third, the sociological interview resulted in some non-response bias, since young mothers, unmarried mothers, and mothers living in the larger towns were most likely to have missed the interview. While this will not have affected the results of Hypotheses I or V, it may well have distorted estimates of the relationships involving education, wage employment, acculturation and relative deprivation.

A fourth source of error, utilization bias in the measurement of infant health, has probably been handled adequately. The study was fortunate to have a measure of parents' general propensity to use health services (the use of preventive care) as well as different measures of infant health which reflected utilization bias in contrasting ways.

Discussion of the Results

Bearing in mind these limitations, perhaps the most striking findings of the study are the three which involve substantial differences between the Dene and the Inuit. First, the independent variables explain a considerable portion of the variation in Dene infant health but virtually none of the variation in Inuit infant health. Second, there is quite a strong positive association between community economic development and health among the Dene but not among the Inuit. Third, there is abundant evidence of the harmful effects of relative deprivation, again among the Dene but not among the Inuit. Can these inconsistencies be explained?

There are two possible sorts of explanations. First, if for some reason the measures of health used in this study are valid for the Dene but not the Inuit, then inconsistencies like these would have resulted. The alternative explanation is that the Dene and the Inuit are indeed experiencing development in different ways. The Dene are enjoying relatively more of the benefits of development while the Inuit are suffering more of the costs. Their responses to economic deprivation, both absolute and relative, are also different, the Inuit apparently able to endure both with few ill effects.

Both explanations will be considered. Are there methodological problems with the measures of health? Are there theoretical propositions in the literature which would have helped predict the results that were obtained? These issues must be discussed before any conclusions can be made about the relationship between economic development and native health in the Northwest Territories.

Methodological Explanations.

Are the dependent variables in this study, infant health, the use of

preventive health services and alcohol use, subject to more measurement error in the case of the Inuit than the Dene? Or, more likely, are these variables less than adequate reflections of health in a broader sense, adult as well as child health, psychological as well as physical health?

The first possible explanation is that the efforts of the nurses of the Northern Health Service may have prevented health problems of Inuit parents from damaging their children's health. It appears to have been the case, during the period of the P.I.M.M. study, that nurses made more strenuous efforts to supervise Inuit infants than Dene infants. In the Keewatin region, as mentioned above on page 58, the nurses took part in a home visiting program to ensure that every infant received treatment for any health problem he might have. In fact, throughout the Arctic Inuit infants received a large amount of health care, both preventive and therapeutic. The highest rates of well-baby contacts, for example, were for Inuit children. They saw nurses for vaccinations and examinations more frequently than white babies and considerably more frequently than Dene babies. The major reason for such extensive supervision has been the very high levels of Inuit infant morbidity and mortality in the N.W.T., higher, despite the more extensive supervision, than for the Dene.

Therefore, if nurses took it upon themselves to ensure that babies were well looked after, despite parents' efforts, there may well have been a serious reduction in the strength of the expected relationship between the parents' psychological and physical health and their children's health. In fact the nurses may have expended a disproportionate part of their time on at-risk infants from problem families, families in which parents are so disabled by physical or mental illness or by alcoholism that they neglect their children. As a result of the nurses' attention, those children might

in fact remain relatively healthy.

For this explanation to be correct, the relationship between alcohol use and the use of preventive health services will be more strongly negative for the Dene than for the Inuit. Children of alcoholic Inuit will have been seen quite regularly by the nurses but the same will not have been true for the Dene. In fact, as shown in Tables IV-18 and IV-19 above, the correlation between parental alcohol use and the use of preventive care is positive (+ .12) for the Dene and negative (- .17) for the Inuit, the reverse of what would have occurred had this explanation been correct. It is therefore not likely the case, for the Inuit more than the Dene, that nurses were able to prevent parents' alcoholism and poor morale from having their harmful effects on children.

A second possible explanation for the differences between the Inuit and the Dene might lie in their different customs regarding the adoption of children. The Inuit have traditionally "shared" children, with the result that many infants are not raised by their natural parents. At least 68 of the Inuit children in this study were permanently adopted (15%) compared to 13 (5%) of the Dene children. Illegitimate children were most likely to be adopted, often by the maternal grandparents.

Stress suffered by the mother during pregnancy can have serious lasting harm for the infant. Mothers under stress may be most likely to give their children up for adoption; often it will be to relatively stable foster parents. (Among the Inuit, adopted children were indeed somewhat less healthy than children who were not adopted). But the P.I.M.M. data on the child's family are for the foster parents, in the case of adopted children, not the natural parents. Therefore statistical analysis may attribute much infant ill health falsely to the characteristics of the foster parents, dis-

torting the true relationships between sociological factors and infant health.

But examination of the probable nature of the distortions shows that this explanation is not correct. For example, most natural mothers probably lived in the same community as the foster parents. If not, then the natural mothers, who tended to be young, single women living in Frobisher Bay and Inuvik, probably sent their children to less developed communities. This would cause a slight reduction in the observed negative association between infant health and community economic development. Adoption customs therefore contribute nothing to explaining why development is less beneficial for the Inuit than for the Dene.

Another possible explanation (which also turns out to be incorrect) is that infant health in Inuit communities is overwhelmingly dependent on the number and severity of the epidemics which occur in a given period of time. Because the settlements are compact, with people living close together under conditions of inadequate sanitation, the entry of a children's disease into the community can result in the illness of nearly every infant living there. Thus it might be argued that the variation in infant health across the N.W.T. is to a large extent due to variations in epidemics from community to community and that any variation due to individual parents' degree of adaptation to the stresses of poverty and/or development would therefore be so small as to make infant health useless as an indicator of parents' psychological condition.

For this to be the case, a sizeable proportion of the total variance in Inuit infant health must be "between-communities" variance, as opposed to "within-communities" variance. A statistic, eta-squared, was computed to measure the "between-communities" variance. It was .066, indicating

that only 6.6% of the variance in Inuit infant health is explained by knowing which communities the children live in. Such a small proportion indicates that the "community-epidemic" explanation is not correct.

Therefore none of the explanations suggested above can convincingly demonstrate that the measures of infant health are less satisfactory reflections of general adult health for the Inuit than they are for the Dene. While infant health may be an imperfect and perhaps even barely adequate proxy for adult psychological and physical health, it is equally satisfactory in both groups. Therefore it can be safely concluded that Inuit adults, as well as children, do not experience the net benefits of development that the Dene experience, nor do they suffer the harm inflicted on the Dene by conditions of relative deprivation.

The best evidence for this conclusion is, of course, the fact that differences between Inuit and Dene in terms of infant health are quite consistent with differences in terms of alcohol use and the use of preventive care. Economic development, more beneficial for Dene infant health than for Inuit infant health, is associated with low alcohol use among the Dene but high alcohol use among the Inuit, is associated with low use of preventive health services among the Inuit but not among the Dene (Tables IV-5 and IV-6). Just as relative deprivation causes poor infant health among the Dene but not the Inuit, it produces high levels of alcohol use, but only among the Dene (Tables V-16 and V-17). This consistency is additional reason to dismiss the "methodological" explanations for the different findings in the two groups.

Theoretical Explanations.

The observed differences between the Dene and the Inuit are probably real. The Dene have been benefitting more from economic development than

the Inuit; they are at the same time more at risk in situations of relative deprivation. Why is this the case?

The literature on N.W.T. natives is considerably more extensive for the Inuit than the Dene.[1] Very little of it deals with both groups in a comparative manner. As a result there exists no body of ready-made propositions concerning their differences which might be of use in understanding the findings of this study. But the literature does contain enough raw material for some admittedly speculative theorizing. The explanations to be offered below are extremely tentative; they are hypotheses which, to be verified, would require a considerable amount of further research.

The explanations can be roughly categorized into three types: (1) theories based on cultural differences between the two groups predating their contact with whites; (2) theories emphasizing present-day economic factors; and (3) theories stressing historical differences in their relations with whites.

Cultural factors. Anthropologists have often been impressed by the flexibility of Inuit social structure and the ability of Inuit individuals to adapt to any contingency.[2] They have remarked that rigid customs and conventions do not exist to the same degree among the Inuit as in other groups, probably because in earlier times a maximum of adaptability was necessary for survival in the Arctic. Examples of this flexibility include the easy adoption of children, wife-sharing, wide variations in leadership structures and so on. One writer, Philip Lange, asserts that this traditional flexibility can be seen in the present-day "diversity of work modes" among the Inuit.[3] They will hunt, trap, carve or work for wages depending on which is most convenient, without becoming disconsolate if a preferred type of

work is not available or rewarding enough to pursue. Flexibility implies a wide range of possible solutions to the problem of earning a living, not limited by such considerations as the familiarity of the work, whether it involves manual or physical labour, whether it is "suitable" for the worker's qualifications or social standing, and whether it is more highly or more poorly paid than previous work. If Inuit are indeed so flexible, then it may not be surprising that they are not burdened with frustrations arising out of unsatisfied aspirations. Flexibility helps in coping with stresses; hence Inuit may, because of a cultural legacy from their ancestors, be particularly resistant to the stresses caused by high levels of both relative and absolute deprivation.

One aspect of this cultural trait is a fatalistic resignation in the face of the inevitable, which whites often notice when they encounter Inuit. Inuit frequently utter the word "_Ayorama_" ("It can't be helped") when things go bad,[4] abandoning goals which seem impossible to accomplish. According to Briggs Inuit find more difficulties inevitable than whites would but, in most instances, "_Ayorama_" is "a rational, pragmatic recognition of a situation that is seen as unpleasant but unavoidable; the lost goal does matter but since wailing will not help, it is childish to fret."[5] If for example an Inuk fails to obtain a job he is seeking, or is laid off, his response may be to say "_Ayorama_" and find another way of earning a living, even if it means accepting welfare. This fatalism, combined with the flexibility to find and accept alternatives, may protect him against depression, alcoholism, and other states which would result in the serious impairment of his own or his family's health.

The Dene may have been less flexible and adaptable than the Inuit in the period before the arrival of whites or they may, through acculturation,

have since lost some of their flexibility. But whichever is the case, they are, according to the Honigmann's (who have studied Inuit and Indians in a number of northern communities), generally less able to withstand situations of stress than are the Inuit.

> We are inclined to explain Indians' difficulties as founded on certain features of their social personality . . . . As long as the Indian's life remains manageable and calls for no major adjustment to crisis, he feels resourceful and optimistic, albeit wisdom recommends proceeding cautiously in whatever he does. In the face of excessive demands upon him, his feelings of capability and resourcefulness quickly collapse, presumably to the accompaniment of anxiety and guilt when his failure is significant. . . . Eskimo possess a less complex and less vulnerable personality than Indians. As one of our (Metis) informants said in comparing Eskimo and Indians, the Eskimo is an easier-going person who is better able to bear frustration and slights to his ego whereas the Indian is more sensitive, touchy and proud. The defense structure of the Eskimo is simpler than that of the Indian, particularly in that the former is less concerned with maintaining a facade in interpersonal relations. Also the Eskimo is not so much inclined to blame others or external circumstances when things go wrong. Under threat or adversity, the Eskimo is likely to take extra care in selecting his mode of response or to exert extra effort to meet his responsibilities.[6]

If the Dene are indeed prouder, more "concerned with maintaining a facade in interpersonal relations," less able to "bear frustration and slights to (the) ego," and more prone to collapse under stress, then it is not surprising that Dene health suffers under conditions of deprivation, absolute or relative, more than Inuit health. The findings of this study are remarkably consistent with the Honigmanns' broad generalizations about personality differences between the Dene and the Inuit.

Another cultural trait frequently observed among the Inuit is what Smith calls "the sharing ethic."[7] It was customary in the days before whites

for all members of the community to share on a more-or-less equal basis in the game that was collected. An unsuccessful hunter and his family were entitled to some of his neighbour's food, with the result that insecurity about the essentials of life existed only when everyone was hungry. Similar patterns of sharing are observed in Inuit settlements today. This custom undoubtedly removes some of the distress from personal economic reverses, such as not having wage employment. It makes life easier in the poverty-stricken settlements with little economic development and also redistributes resources to the relatively deprived.

While the Dene have a similar tradition,[8] it may today be considerably weakened, under the influence of white institutions and the whites value system. Observers have remarked on a common recent phenomenon, young unmarried Dene men with high-paying jobs who squander their earnings on luxuries, neglecting needy relatives.[9] In sharp contrast are the Inuit miners of Rankin Inlet studied by Williamson in the late 1950's, whose share of their own paycheques, after all friends and relatives had been helped, often was so small that it did not justify staying on the job.[10] If today the Dene are more acculturated than the Inuit in this respect, then they probably suffer more real deprivation when they are unemployed but they also get to keep more of their earnings when they are employed. There are thus two reasons, in the absence of a strong sharing ethic, to take highly remunerative work when it is available and to be in distress when it is not.

Economic factors. Economic conditions might also help to explain the findings of this study. Hunting and trapping can no longer support the Dene population of the Mackenzie District, because of a shortage of game animals partly caused by over-trapping earlier in this century. Therefore most Dene are quite dependent for their livelihood on wage employment and, if it is

not available, on welfare. In the less developed communities where jobs are scarce, poverty is severe and health may be in jeopardy as a result. Thus the explanation for the positive relationship between Dene health and economic development may be very simple.

The same relationship would not exist among the Inuit, according to this line of reasoning, if hunting and trapping were still remunerative enough to support a substantial part of the population. Usher's research shows that at least one group of Inuit, the Banks Islanders, do derive a relatively high standard of living from hunting and trapping,[11] though they may well be an atypical case. Similar research in other parts of the N.W.T. is necessary to evaluate the adequacy of this theory. Income from hunting and trapping is not reflected in any of the measures of community economic development used in this study. Hence a settlement with a low score on the index of development may in fact be as well or better off, if hunting and trapping are profitable there, than a more "developed" community with more jobs but fewer game animals. Levels of health may be relatively high as a result.

If game is plentiful, then an unemployed Inuk can support his family by returning, if only for short trips by snowmobile, to the land. Among the Inuit fathers in the P.I.M.M. study, more than one-fourth hunt, fish and trap on a year-round basis (Table V-5). Even a man with a high level of education might not feel relatively deprived if his profits from trapping match the wages that he would earn as a job-holder.

A similar argument can be made with regard to carving, which is an important industry in the Inuit communities on Baffin Island. In some of them virtually the entire adult population carves and many carvers earn a

substantial income. Carvers in Arctic Bay, where highly-paid wage employment is available at the Nanisivik mine fifteen miles away, claim to be able to earn more money carving than working for wages.[12] If that is the case, then a shortage of wage employment is not a source of distress. It may be those with steady jobs, unable to go hunting whenever they want, who are relatively deprived.

The data collected by the P.I.M.M. study offer some support for this theory but it is slight. Interviewers asked the mothers to estimate their families' total cash income during the preceding year. While "don't knows" were common (30% of the Inuit families, 40% of the Dene families), 43% of the Dene women who responded stated their family income to be less than $1000; 21% claimed to have had an income in excess of $9000. Fewer of the Inuit families (33%) earned less than $1000 per year and slightly more (24%) earned more than $9000. The Inuit are, on the whole, better off than the Dene, perhaps because hunting, trapping and carving contribute substantially to many families' income. This is reflected in welfare statistics: 54% of the Dene families who responded received social assistance part or all of the year; 42% of the Inuit families were on welfare. These figures, though they show the Dene to be worse off economically than the Inuit, do point out the extreme poverty which exists in both groups. The absence of a relationship between economic development and health among the Inuit is not because Inuit from the less developed communities have grown rich from hunting, trapping and carving.

The history of native-white relations. A third explanation for this study's findings, in contrast to those which stress cultural and economic factors, focuses on the historical differences between the Dene and the Inuit in the timing and nature of their contacts with whites and on the differences in

native-white relations which resulted. Very briefly, the Dene have been under white influence for many generations. The Inuit, in contrast, have experienced a serious white presence for a generation or two at most and hence are considerably less acculturated than the Dene. Although both groups lived a subsistence existence before whites entered their land, the Dene are now so acculturated that they reject mere subsistence while the Inuit retain much of their subsistence orientation. They, unlike the Dene, are not acculturated enough to feel relatively deprived when they have enough to live on.

Inuit acculturation is slowed considerably by the language barrier, not to mention the immense social distance, separating them from the well-educated, well-paid, transient civil servants living in their part of the Arctic. Most of the Dene, in contrast, speak English and live in communities with a greater variety of inhabitants, including Metis and lower-class whites (who are in many ways quite different from the middle-class civil servants of the North). The Metis and lower-class whites are probably more important as acculturation agents and reference groups than the civil servants, and hence have a greater influence in raising Dene aspirations.

What evidence exists to support this theory? First, most of the Inuit parents in the P.I.M.M. study are only recently off the land, where contact with whites was fleeting, while the large majority of the Dene parents never lived on the land. Approximately 63% of the Inuit mothers and 69% of the Inuit fathers spent part of their lives in hunting camps outside the settlements. This is probably representative of the Inuit population as a whole since migration into the settlements reached its peak only in the 1960's. In contrast, less than 10% of the Dene mothers and 12% of the Dene fathers have spent even one year living in hunting camps. Unlike the Inuit they have

all their lives spent at least part of the year in town.

Many of the Dene communities have had substantial white populations throughout this century, attracted by the fur trade, mineral discoveries and business opportunities. White visitors to Inuit lands, except for the Mackenzie Delta, were mostly Hudson's Bay traders, missionaries and policemen, whose numbers were tiny in comparison to the number of whites in the Dene regions along the Mackenzie River and Great Slave Lake.

One indicator of the prevalence of whites in the Mackenzie District in the past is the large number of Metis presently living there. Of the Dene mothers interviewed in the P.I.M.M. study, 26% identified themselves as Metis. A majority are descended from unions between white traders, trappers, prospectors and miners and Dene women, though some can trace their origin to the Red River Metis who came North following the defeat of Riel. The Metis are an important sub-population in the district, occupying a social position between the whites and those Dene who are still treaty Indians. There is no similar intermediary group between Inuit and whites in the Arctic outside the Mackenzie District. Most persons of mixed white-Inuit origin were the products of short-term liaisons between white men and Inuit women, were raised as Inuit, and are indistinguishable, in any social sense, from Inuit.

Intermarriage between Dene and whites is still common. During 1973-74, the period of the P.I.M.M. study, births from mixed Dene-white marriages outnumbered births from mixed Inuit-white marriages by 64 to 31, despite a greater Inuit population. A child with one Dene parent was three times as likely (a 15% chance) to have a white parent as a child with one Inuit parent (a 5% chance). Intermarriage has and continues to be a strong acculturative

force in the North, but largely among the Dene.

Employment with and for whites has also promoted acculturation to a white way of life. When the whites came in to trade for furs, they hired many Dene men to work as canoe men, York boat men, mail drivers, steamboat deckhands, stevedores and river pilots, bringing supplies in to the trading posts and carrying furs out.[13] Thus wage employment in the Mackenzie District dates back to the Nineteenth century. Transportation to the trading posts in the Inuit regions, in contrast, was by ship; hence a comparable amount of Inuit labour was not needed. The earliest large-scale wage employment opportunities for Inuit occurred in the 1950's and 1960's when the D.E.W. line was built, when the Rankin Inlet mine began operation and when the federal government launched construction programs in the Northern settlements. Long before that, Dene had participated in the fur boom of 1910 to 1938 which brought large numbers of white trappers and traders to the Mackenzie, and in the construction and transportation industries which grew up to service the men and companies engaged in mineral exploration and mining. A commercial fishery established on Great Slave Lake in the 1940's provided employment as well as entrepreneurial opportunities for many Dene of the region. Thus the Dene have participated along with whites in a modern money economy for several generations, considerably longer than the Inuit.

This may be a partial explanation for this study's findings. Dene health is endangered under conditions of absolute or relative deprivation because large numbers of today's Dene are several generations removed from a subsistence hunting and trapping life. Their parents had jobs, so they expect the same. When work is not available, they suffer the frustrations commonly associated with unemployment elsewhere, with damage resulting to their health. Few of the Inuit have a history of steady employment. As a

result they haven't come to expect it, aren't frustrated when it is not available and do not suffer the same damage to their health.

The Dene are more acculturated to the ways of white southerners than the Inuit partly because they have received more schooling from the whites. As indicated above on page 113, nearly all of the Dene parents in the P.I.M.M. study received an education in a school run by whites, while in more than one-third of the Inuit families neither parent had ever been to school. The Dene parents, on the average, received almost twice the number of years of schooling of the Inuit parents. Moreover, many of the Dene parents themselves have come from educated families; their parents attended the mission schools operating in the Mackenzie Valley since the 1920's.

Education has had such a short history in the Inuit regions outside the Mackenzie District that its influence has been slight. Just as most Inuit have apparently left school without gaining a command of English[14], most have not managed to acquire the whites' feelings about the value of enduring the drudgery of daily supervised labour in order to achieve individual monetary and spiritual rewards. This is probably the case even among those Inuit with an "above average" education--four, five or six years. It is not surprising that incongruence between education and wage employment has little effect on health when the levels of education are generally so low. This source of relative deprivation may begin to be a problem only when Inuit education has become as extensive as Dene education is now.

Many generations of close contact with whites, including intermarriage, wage employment and education, have had an immense effect on Dene society and culture. Some anthropologists even suggest that the traditional Dene culture has been completely demolished in those parts of the Mackenzie district which

experienced the heaviest white presence. The Honigmanns describe the "frontier culture" of Inuvik, shared by the Treaty Dene, the Metis, the Inuit and a few of the long-time white residents of the area.[15] Smith prefers to view the distinctive "Delta culture" as a sub-culture retaining some elements of the traditional native cultures but influenced strongly by the waves of working class whites--whalers, trappers, explorers, prospectors, construction workers, and drilling crew members--to whom the Mackenzie Delta was a frontier where the conventions of middle-class respectability could be flouted.[16] Thus the culture of the Delta is, according to the Honigmanns, a counter culture to white middle-class culture. But unlike the counter culture which flowered briefly around the world in the late 1960's, the Delta culture apparently does not exalt poverty as desirable. Their cultural transformation has, on the contrary, made the Delta natives less satisfied with the subsistence standard of living of the past.[17]

Outside the Mackenzie District, the Inuit have been insulated from cultural pressures of this sort. Even after World War II when more whites entered the Inuit lands, efforts were often made to prevent them from having contact with the Inuit. Servicemen, white workers on the D.E.W. line and white miners at the Rankin Inlet mine, for example, were subject to restrictions against visiting the Inuit. The Inuit, as a result, have retained more of their traditional culture than the Dene.

A notable example is language. Most Dene use English for everyday purposes and a substantial number have completely lost the capacity to speak a Dene language. Most Inuit, on the other hand, rely on the Inuit language. In most communities only a small minority knows more than a few words of English, necessitating the use of interpreters when whites and Inuit wish to communicate.[18]

Language is of central importance in the acculturation process, as several northern researchers have remarked after studying native-white relations in the N.W.T.[19] There may well be an "over-the-hump" process involved: early contact with whites produces very slow acculturation, mainly the acquisition of useful material goods, until their language is learned; when the language barrier is overcome, increased communication leads, perhaps quite rapidly, to cultural changes of a more profound nature --changes in beliefs, values, rules of conduct, identities. If such is the case, then the Dene are "over the hump," acculturating at a rapid pace, while the Inuit have not yet reached it.

Dene acculturation is probably facilitated by the existence of lower-class whites and Metis in most of their communities. These groups occupy an intermediate position, culturally, economically and politically, between the powerful civil servants and the Treaty Dene. They serve as conduits for the diffusion of white culture, though what is diffused may not be entirely to the liking of the middle-class civil servants. They serve, probably much better than the civil servants, as reference groups for the treaty Dene because the social distance involved is much less. And since most Metis and lower-class whites are steadily employed, earning a decent income, they inspire the treaty Dene to aim for the same kind of life.

This is not the case in most Inuit communities however. Several writers have described the deep and impassible social chasm separating the Inuit from the whites.[20] While the majority of the Inuit are just recently in from the land, most of the whites are young, well-educated, upwardly mobile civil servants, often in the early stages of their careers. The cultural differences between the two groups are reinforced by immense differences in educational standing, income, standard of living (housing differences are extremely

apparent), and power. As representatives of large powerful organizations, the whites are there to govern and the Inuit have little choice but to obey. There are no intermediate groups, as in the Dene communities, to help span this immense social distance, with the result that little contact occurs and acculturation is very slow.

Segregation between Inuit and whites in the Arctic settlements is virtually complete, with little interaction beyond what is necessary for the discharge of the job responsibilities of the white officials.[21] There is social pressure within the white group to discourage fraternizing with the Inuit, even to the extent of ostracizing or questioning the mental stability of those who do.[22] The Inuit, in turn, minimize their contact with whites by avoiding them and when that isn't possible, by passivity, submissiveness and a defensive smile.

According to several anthropologists, the smiling friendliness for which the Inuit are famed is most of the time a protective front, behind which lies the anxiety and hostility Inuit feel towards whites.[23] These feelings probably reduce considerably the attractions of wage employment, since most jobs require taking orders from whites.

One source of anxiety on the job is the difference between Inuit and white norms governing face-to-face interaction. The Inuit traditionally avoid displays of anger and are very careful to respect the personal autonomy of the other person; it is much more acceptable among whites to express annoyance and frustration and to give advice and orders.[24] Williamson describes the difficult adjustments Inuit miners at Rankin Inlet had to make when confronted with white supervisors who used normal methods to oversee workers:

> There were a number of instances . . . where an Eskimo employee stayed away from the job after he had been disturbed or even frightened by a vigorous harangue by

> one of the white mine employers. Because of their traditional conditioning, wherein almost all relationships are very intimate and personal, the Eskimo were not used, in most cases, to the impersonal way in which a shift boss might handle a situation, wherein a rather loud and demonstrative mode of speech might be used as the individual foreman's normal manner of handling men or particular problems.[25]

Vallee reports that the "bossiness" of the white mine supervisors was one of the reasons eleven of the thirteen Baker Lake Inuit who went to work in the Rankin Mine had quit their jobs within a year, despite the high wages.[26] Anxiety and tension on the job probably make many Inuit content to subsist on hunting, trapping, carving, welfare or other activities which allow independence and isolation from whites. The Dene, who are acculturated enough to understand both the language and the temperament of their bosses, are probably able to endure that aspect of their jobs with more equanimity.

Inuit hostility to whites is rarely expressed, at least to the objects of it. But Vallee talked to Inuit men who admitted that whites made the Inuit "feel like dogs who can't go in the tent" and that as a result Inuit are fond of whites "when there are only a few and when they are only visiting."[27] Anger and discontent with whites and with the government that employs most of them appears to be building.[28] It may even be so intense that Inuit who accept jobs with the whites are considered traitors, Uncle Toms or "white man's Eskimos,"[29] who have sold out to the enemy. If feelings of hostility are indeed widespread, this is another reason why Inuit without jobs may feel relatively privileged rather than deprived and why a low level of economic development, which keeps the white population low, has not been harmful for Inuit health.

Wage employment may be less stigmatizing and hence more attractive to the Dene because of the large Metis population which hold jobs yet wield no power over the other Dene. Taking a job is not so clearly a traitorous act.

Finally, the immense social chasm between the Inuit and the whites in an Arctic community inevitably produces in each group a keen sense of ethnic boundaries. The Inuit cannot, in the face of cultural, educational, occupational, income, language and power differences,identify with whites. They cannot conceive of assimilating. As an Inuit man in Arctic Bay expressed it:

> The Inuit have to do what they believe is right because their way of thinking is not the same as the Qallunaat (white man). The real Inuit cannot live the same way as the Qallunaat and the Qallunaat cannot live as the Inuit do. It is not possible for a real Qallunaat and a real Inuit to be identical.[30]

This sense of separateness, the belief that Inuit and whites do not think the same way and cannot live the same way, must inevitably extend to the question of jobs and income. It is the whites who have the good jobs and the highest standard of living. There are no poor whites in the Inuit settlements. And because the Inuit cannot be like whites, they cannot expect to do the same kinds of work and achieve the same affluence. The middle-class officials are simply too distant and too different to serve as a reference group that would raise Inuit aspirations. As a result the Inuit remain satisfied with, or perhaps resigned to, their poverty.

The Dene, in contrast, have the Metis as a reference group who in turn can compare their lot with lower-class and middle-class whites. The continuous nature of ethnic and class distinctions makes it considerably easier for the Dene to picture themselves achieving what others have achieved and, conversely, more difficult for them to accept failure. Poverty is much more damaging as a result.

This theory is an attempt to explain why poverty and relative deprivation fail to produce the health problems among the Inuit which have

been observed among the Dene. The Inuit, because their contact with whites has been recent, are not yet acculturated enough to feel relatively deprived.

Yet there is every reason to believe that contact with whites, through television, education and more wage employment, will steadily increase. The Inuit will become more acculturated and at the same time more dependent on the income from wage employment. The costs associated with relative deprivation, now observed among the Dene, will begin to show up for the Inuit as well.

In fact they have already begun to show up. Robert Williamson, an anthropologist lived in Rankin Inlet before, during and after the mine was in operation there. In his book Eskimo Underground he describes the experience of the Inuit who worked in the mine.[31] In the first years of the project absenteeism rates were high as the Inuit miners regularly left work to go hunting, often to escape the stresses of the job. In the later years, up to 75% of the Inuit miners had come to see wage-earning as a more-or-less permanent life pattern. It was a difficult adjustment for some of the men but within five or six years most of the workforce were both skilled and committed to it. According to Williamson their wives adapted most easily to the new life style and quickly became dependent on the amenities which could be purchased with paycheques from the mine. When the mine closed, real hardship resulted. Some of the Inuit miners were able to secure similar work in Yellowknife, Asbestos Hill, Quebec, and Lynn Lake, Manitoba, but the majority were faced with a return to hunting, trapping and welfare. The consequences, Williamson reports, included high rates of emotional distress, disorganized behavior and psychosomatic illness, especially among the women, and heavy alcohol use. The P.I.M.M. study confirms that alcohol use is unusually high in Rankin Inlet and other settlements which experienced a substantial economic decline (above, page 141). Thus it is clear that the Inuit are susceptible to

the traumas of relative deprivation when they have enjoyed a high standard of living for a lengthy period. But, unlike the Dene, few Inuit have ever been so fortunate (or unfortunate). The Rankin Inlet Inuit are among that small minority.

To summarize, three theories have been presented to explain the differences in findings for the Dene and the Inuit. The first theory emphasized cultural differences between the two groups predating their contact with whites, the second theory stressed economic factors, and the third theory focussed on historical differences in the timing and nature of their relations with whites. While further research would be necessary to confirm each theory, it is the opinion of this researcher that the third theory has the greatest potential for explaining the findings of this study.

Conclusions

One of the conclusions to be drawn from this study is that economic development is beneficial for the health of the Dene. Hence more development is needed if the serious health problems they are currently suffering are to be alleviated.

For the Inuit, development is at present not bringing about an improvement in health. But if the high birth rate puts even greater strains on the stock of game animals, if the market for Inuit carvings and other handicrafts does not keep up with the population increase, then the resulting economic hardship will necessitate industrial development. If education and other acculturative forces continue to break down language barriers, to narrow the social distance between whites and Inuit and perhaps even to relieve the present power imbalance between them, then the Inuit will probably come to aspire to and even demand the economic benefits whites enjoy. Economic

development will be necessary to meet these demands if psychological and health problems are to be avoided.

But if development is in fact beneficial, why did the Mackenzie Valley Dene unanimously reject the pipeline which would have provided income and jobs for many of them? First, they recognized the short term nature of the project. Few jobs would be available after the construction phase was completed. Temporary affluence would be followed by a poverty made even bitter. Second, damage to the environment could put an end to hunting and trapping on which some of the Dene depend for their livelihood. The third and most important reason for rejecting the pipeline results directly from feelings of relative deprivation: the only way to narrow the economic gap between the Dene and the whites who are entering the region in every greater numbers is to establish Dene ownership and control of the land. As owners of the land, the Dene would collect rents from a pipeline or any other natural resource development project. The rents could then be used to invest in additional projects which would yield a steady long-term return and generate long-term employment opportunities. But first the Dene must establish their ownership of the land. Hence their assertion, repeated many times before the Berger Commission, that the pipeline must not precede a land claim settlement. Opposition to the pipeline is a necessary short-term strategy in the process of bringing about long-term economic development that will be of maximum benefit to the Dene. Paradoxically, "No!" to the pipeline means "Yes!" to economic development.

Dene militancy, which increased considerably during the pipeline debate, is fueled by feelings of relative economic deprivation in a process repeated time and again in colonial situations around the world. The Inuit

have not yet reached the stage of relative deprivation. But it is to be expected that further acculturation will bring about dissatisfaction with a standard of living so much below that of white Canadians. The result will be frustration, despair and impaired health on one hand and militancy on the other. The Inuit are traversing the same path as the Dene; they are just at an earlier stage.

It is difficult to make suggestions regarding government policy except to recommend economic development which provides lasting benefits to native people. It may be better, if the health and well-being of northern natives is indeed an important goal of the government, to discourage projects like the Rankin Inlet mine and the Mackenzie Valley pipeline which end shortly after they begin. The proliferation of short term projects in different parts of the North will produce for the native people a very disorganized existence as a migrant workforce, experiencing intermittent periods of high wages in bunkhouses away from home followed by periods of abject poverty back home when the job is ended. The social costs and the health costs of this kind of development will be enormous. It would be preferable to elect slower but more even development, projects which contribute permanently to the northern economy even if they are not always the most profitable from the point of view of southern investors. In this respect it is inevitable that there will be a conflict between the government's goal of maximizing northern resource development for the benefit of the Canadian economy as a whole and its goal of maximizing the well-being of the northern natives. The natives' fate will depend on the relative importance the government assigns to each of these two goals.

Notes

CHAPTER I INTRODUCTION

1. Berger, Thomas R. Northern Frontier, Northern Homeland. The Report of the Mackenzie Valley Pipeline Inquiry, Volume I. Ottawa: Supply and Services Canada, 1977, p. xxvi.

2. Berger, *op. cit.*, p. 154.

CHAPTER II ECONOMIC DEVELOPMENT AND NATIVE HEALTH: CONFLICTING HYPOTHESES

1. Canada. Department of Indian Affairs and Northern Development. Canada's North: 1970-1980. Statement of the Government of Canada on Northern Development in the 1970's. Ottawa: Information Canada, 1972, p. 10. In its document the government neglected to define "economic development" though clearly the term was used as a synonym for economic growth, increased real value of goods and services produced. Rea (K. J. Rea. The Political Economy of Northern Development. Science Council of Canada Background Study No. 36. Ottawa: Information Canada, 1976, p. 25) prefers to reserve the term for changes in the structure of the economy rather than for changes in the value of its output. But would structural change without economic growth be "development"? Since they usually occur together the question is largely academic and "economic development" in this study will refer to economic growth and/or structural change. See p. 93 below for a detailed description of the manner in which the variable is operationalized in this study.

2. Canada. Canada's North: 1970-1980, *op. cit.*, p. 6.

3. *Ibid.*, p. 11.

4. *Ibid.*, p. 19.

5. *Ibid.*, p. 14.

6. *Ibid.*, p. 11.

7. *Ibid.*, p. 15.

8. *Ibid.*, p. 24.

9. Rosen, George. A History of Public Health. New York: M. D. Publications, 1958, p. 179.

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11. Myrdal, Gunnar. *Asian Drama*. New York: Twentieth Century Fund, 1968, chapter 30; C. C. Hughes and J. M. Hunter, "Disease and 'Development' in Africa", *Social Science and Medicine*, V 3 (1970), pp. 443-493.

12. Myrdal, *op*. *cit*., pp. 1608-1616; Hughes and Hunter, *op*. *cit*., pp. 445-449.

13. Census data for 1971 show a greater percentage of native adults had no income than did members of other ethnic groups. Natives had by far the lowest average income of any ethnic group in Canada. (John Kralt. *Ethnic Origins of Canadians*. 1971 Census of Canada, Vol. V, part 1 (Bulletin 5.1-9). Ottawa: 1977, p. 76).

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15. Canada. Statistics Canada. *Perspective Canada*, Vol. I. Ottawa: 1974, p. 33. The estimates are for 1971.

16. Infant mortality rates are reported each year in the annual reports of the Northern Health Service (Canada. Department of National Health and Welfare, Medical Services Branch. *Annual Report on Health Conditions in the Northwest Territories*. Edmonton: 1963 to 1974.)

17. Obtained from P.I.M.M. study data tapes.

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19. Canada. *Annual Report on Health Conditions in the Northwest Territories*, 1974, p. 36.

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22. Jenness, Diamond. *Eskimo Administration: II Canada.* Montreal: Arctic Institute of North America, 1964, p. 167; Charles W. Hobart, testimony before the Berger Inquiry, Berger, *op*. *cit*., p. 148.

23. Canadian Arctic Gas Pipeline Limited. *Regional Socio-Economic Impact Statement, Section 14.c.* An exhibit in support of applications to

the Department of Indian and Northern Affairs and to the National Energy Board, 1976, pp. 30-31.

24. Hughes and Hunter, *op. cit.*, pp. 443-493.

25. *Ibid.*, p. 476.

26. *Ibid.*, p. 481.

27. Crowe, K. J. *A History of the Original Peoples of Northern Canada*. Montreal: McGill-Queen's University Press, 1974, pp. 127-129; J. Helm *et al.*, "The Contact History of the Subarctic Athapaskans: An Overview", *Proceedings of the Northern Athapaskan Conference, 1971*. (Canadian Ethnology Service Paper no. 27). Ottawa: National Museum of Canada, 1975, pp. 302-349.

28. Crowe, *op. cit.*, p. 110.

29. Canada. *Annual Report on Health Conditions in the Northwest Territories*, 1973, 1974 and 1975.

30. Schaefer, *op. cit.*, pp. 196-204.

31. *Ibid.*, p. 200.

32. *Ibid.*, p. 199.

33. Testimony of Pat Kehoe before the Berger Inquiry. Berger, *op. cit.*, p. 159.

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35. Figures are from 1961 and 1971 census tapes (Canada. Statistics Canada. User Summary Tapes. Enumeration Area Series.)

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95. Attempts are made to encourage "native participation" in these decisions. But when natives disagree with plans put forward by white officials, the emphasis on native participation often fades (Wilf Bean, "Colonialism in the Communities", in Watkins, op. cit., pp. 130-141). Natives are presently struggling to gain power, by running for office in local, territorial and federal elections and by pressing for a land claim settlement that will give them complete ownership and control over large areas of the N.W.T. However, economic development, plans for resource extraction and the growing white population are forces counteracting native efforts to gain power.

96. It is sometimes argued that natives are free to move back into the bush and thereby escape white domination. Some are doing this. But wilderness and game, even in the vastness of the N.W.T., are not inexhaustible, especially with extensive oil and gas exploration

underway. Moreover the native people have become dependent on government benefits such as health care, housing and social assistance. Given that dependence, they have no choice but to live in the settlements and surrender their decision-making power to whites.

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Chapter III

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9. Schaefer, *op*. *cit*.

10. "A fair percentage of our morbidity in infants and children is related to alcohol problems in families with subsequent neglect of children, but this is very difficult to prove." Canada. *Annual Report on Health Conditions in the Northwest Territories*, 1970, p. 16.

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16. Children were omitted from the study if there were no health records at all dated later than one hundred days after birth.

17. Among the Dene, 25.5% of the single mothers missed the sociological interview while only 11.9% of the married mothers missed it. 36.7% of the mothers from the six large towns missed it, compared to only 9.9% of the mothers from the smaller settlements. Among the Inuit, 23.4% of the single mothers, 6.8% of the married mothers, 33.8% of the women from the large towns, and 6.8% of the women from the smaller settlements missed the sociological interview.

18. This measure was modified for cases in which the child died at or shortly after birth, before it was possible to bring it in for well-baby visits. Use of preventive care was measured by adjusting the number of prenatal visits as follows: $PV_i = \overline{PV} \quad PR_i / \overline{PR}$, where PV_i is the total use of preventive care (of the mother whose child has died), $\overline{PV}$ is the mean use of preventive care, prenatal visits plus well-baby visits, of mothers whose children did not die, PR_i is the number of prenatal visits of the mother of this child, and $\overline{PR}$ is the mean number of prenatal visits of mothers whose children did not die.

19. Canada. Annual Report on Health Conditions in the Northwest Territories, 1971, p. 13 and 1972.

20. In the case of an unmarried mother or when alcohol use information was available for only one parent, the family alcohol use score was calculated by doubling the single parent's score.

21. This is borne out by the rates of non-response for ratings of alcohol use. Ratings were unavailable for 43.3% of the Dene women who lived in the six large towns, compared to 9.4% of the Dene women from small settlements. Ratings were unavailable for 38.0% of the Inuit women from the large towns, for 13.1% of those from small settlements.

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23. The mean length-of-stay in hospital for infants living in settlements with no hospital was 18.5 days for Inuit infants and 17.4 days for Dene infants. The mean length-of-stay for infants living in communities with a hospital was 14.9 days for Inuit infants and 10.6 days for Dene infants.

24. Health centres, like nursing stations, are staffed by registered nurses. However they do not have beds and hence are unable to provide inpatient care. This distinction is not very important, however, since nursing station beds are rarely used (for infants at any rate). If children require inpatient care they are evacuated to a hospital, remaining in the nursing station only until the next flight leaves for a community with a hospital. This is usually not more than one day.

25. The diseases listed on the questionnaire comprised about 80% of the morbidity contacts filed for Dene and Inuit infants during the period of the P.I.M.M. study.

26. The inter-judge reliability coefficient used in this study was computed using analysis of variance. It can be interpreted as the correlation between the set of observed mean ratings across judges and the mean ratings that would result if another sample of judges, of the same size and drawn from the same population, rated the diseases. A discussion of this coefficient is in B. J. Winer, Statistical Principles in Experimental Design second edition. New York: McGraw-Hill, pp. 283-289.

27. S_i , the severity score for disease i , was computed according to the formula:

$$\underset{k=1}{\overset{4}{\ }}\quad \underset{j=1}{\overset{28}{\ }}\quad (Q_{ijk} \cdot W_k)\ /280$$

where Q_{ijk} is the severity rating given to the i^{th} disease on the k^{th} dimension by the j^{th} paediatrician, and where W_k is the weight assigned to the K^{th} dimension (W_1 and $W_2 = 4$; W_3 and $W_4 = 1$).

28. The paediatrician who assigned the severity scores to the less common diseases was representative of the sample as a whole. His ratings of the 15 diseases on the questionnaire had high correlations with the means of the 28 paediatricians' ratings: .94, .89, .77, and .89 for the four severity dimensions.

29. See the discussion of the adjustment of length-of-stay of hospital patients who lived out of town, above p. 66.

30. Chiang, *op. cit.*, Sullivan, *op. cit.*, Sanders, *op. cit.*

31. Patrick *et al.*, *op. cit.*, J. W. Bush and M. M. Chen, "Methods for Measuring Levels of Well-being for a Health Status Index", *Health Services Research*, V 8 (1973), pp. 228-345.

32. Torrance, G. W. "Health Index and Utility Models: Some Thorny Issues", *Health Services Research*, V 8 (1973), pp. 12-14.

33. The adjustment raised the mean health score for the Inuit infants from 86.5 to 92.3 and reduced the standard deviation from 23.3 to 5.9. It raised the Dene mean health score from 90.2 to 94.1, and reduced the standard deviation from 19.7 to 5.8.

34. Curtis, L. F. and E. F. Jackson, "Multiple Indicators in Survey Research", *American Journal of Sociology*, V 68 (1962), pp. 195-204.

Footnotes

CHAPTER V. THE COSTS OF DEVELOPMENT.

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[2] Missing data were handled as follows: if none or one of the four questions were answered, no acculturation score was calculated. If two of the four questions were answered, the responses were summed (to a maximum score of 4) and the sum was doubled to give scale values ranging between zero and 8. If three of the four questions were answered, the responses were summed and the sum was multiplied by 1.33 to give scale values ranging between zero and 8.

[3] Mothers' breast-feeding practice is controlled because it is likely to be associated both with acculturation and infant health (see above, page 18). This accomplished by representing it as a set of two dummy variables which are entered into the regression equations as controls.

[4] The path coefficients for the composite index of community economic development, representing the direct effect of development on Dene health after education, wage employment and the native wage employment rate are in the equations, is not changed much when the three relative deprivation terms are added. For example the path coefficient for community economic development on the composite index of infant health is +.33 before the three relative deprivation terms are added. It is +.27 after they are added. Thus relative deprivation is not the major explanation for the observed positive relationship between economic development and Dene infant health.

Notes

CHAPTER VI. CONCLUSIONS.

[1] Slobodin, Richard. "Canadian Subarctic Athapaskans in the Literature to 1965," The Canadian Review of Sociology and Anthropology, viz (1975), p. 284.

[2] Willmott, W. E. "The Flexibility of Eskimo Social Organization," Anthropologica (New Series) V2 (1960), pp. 48-59; Nelson, H. H. Graburn. "Eskimo Law in the Light of Self and Group Interest," Law and Society Review, v4 (1969), pp. 45-60; Jean Briggs, Never In Anger. Cambridge: Harvard University Press, 1970; Philip Large. "Some Qualities of Inuit Social Interaction," in Robert Paine (ed.), The White Arctic. Institute of Social and Economic Research, Memorial University of Newfoundland, 1977, pp. 107-128.

[3] Lange, op. cit., p. 13.

[4] Briggs, op. cit., pp. 49-50, 364; Robert Williamson Eskimo Underground. Uppsala, Sweden, 1974, p. 33; Frank Vallee, "Eskimos of Canada as a Minority Group," in Jean Leonard Elliott (ed.) Native Peoples. Scarborough: Prentice-Hall, 1971, p. 87.

[5] Briggs, op. cit., p. 365.

[6] Honigmann and Honigmann, op. cit., pp. 76-77.

[7] Smith, Derek G. Natives and Outsiders: Pluralism in the Mackenzie River Delta, Northwest Territories. Ottawa: Department of Indian and Northern Affairs, 1975, pp. 56-57.

[8] Berge, op. cit., p. 96; Scott Rushforth, "Country Food," and Michael Asch, "The Dene Economy," in Watkins, The Dene Nation: The Colony Within, pp. 32-61.

[9] Smith, Natives and Outsiders, op. cit., p. 56; Asch, op. cit., p. 56.

[10] Williamson, Eskimo Underground, p. 159.

[11] Usher, Peter.

[12] According to Taqtu, an Inuit man from Arctic Bay:

> When I became a better carver I stopped working. I had wanted to see how one could make the best living: by working, carving or hunting; and I discovered that if you do a lot of carving, and carve well, you can make more money than by working. Now I carve and hunt, which is what I like best. I can make a good living and I enjoy doing both. I haven't been doing a great deal of carving recently because I have been able to support my family by hunting.

Atoat, an Inuit woman from Arctic Bay agrees:

> An employed person receives a monthly income, no more or less than what he is due. But if you are carving steadily, you can make much more than the average monthly income. If you aren't doing too much you can make about the same or just a little less. It's an ideal thing to do, even though it's sometimes tiresome. We don't work because we like to be Inuit and live that life-style. In summer, we leave Arctic Bay and don't return till freeze-up. We usually take our stone and tools and continue to carve while we are out in camp.

Cowan, Susan (ed.). We Don't Live in Snow Houses Now. Canadian Arctic Producers Limited, 1975, pp. 165 and 168.

[13] Slobodin, Richard. Metis of the Mackenzie District. Ottawa: Canadian Research Centre for Anthropology, Universite Saint-Paul, 1966, p. 80.

[14] Brody, op. cit., pp. 199-200.

[15] Honigmann and Honigmann, op. cit., pp. 13-61.

[16] Smith, Natives and Outsiders, pp. 51-52.

[17] Smith's study of the occupational aspirations of Inuit, Dene and white students in the Delta found few differences among the three groups in terms of preferences for particular jobs, for locations of work and so on. The native students clearly dislike traditionally native work and would prefer to become pilots, stewardesses, radio operators, doctors, nurses, bankers and office workers. They would, they claim, most like to work in Edmonton and Vancouver and least prefer to live on the land or in one of the isolated native settlements. Smith, Natives and Outsiders, pp. 149-162.

[18] The N.W.T. Manpower Survey, carried out by the Department of Indian Affairs and Northern Development between 1968 and 1970, provides data on language use.

[19] Vallee, Kabloona and Eskimo in the Central Keewatin, *op. cit.*, p. 147 and Williamson, Eskimo Underground, *op. cit.*, p. 175.

[20] Brody, *op. cit.*, Williamson, Eskimo Underground; Paine, The White Arctic.

[21] Brody, *op. cit.*, pp. 75-76.

[22] Dunning, op. cit., Vallee, Kabloona and Eskimo in the Central Keewatin, p. 105; Brody, *op. cit.*, p. 60.

[23] Briggs, *op. cit.*, pp. 276-277; Williamson, Eskimo Underground, pp. 166-171; Brody, *op. cit.*, p. 152; Vallee, in Elliott (ed.), p. 87.

[24] Briggs, *op. cit.*

[25] Williamson, Eskimo Underground, p. 115.

[26] Vallee, Kabloona and Eskimo in the Central Keewatin, p. 56.

[27] *Ibid.*, p. 54.

[28] Cowan (ed.), pp. 72, 177, 182; Brody, p. 229.

[29] Smith, Natives and Outsiders, p. 46.

[30] Cowan (ed.), p. 177.

[31] Williamson, Eskimo Underground, pp. 111-135.

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